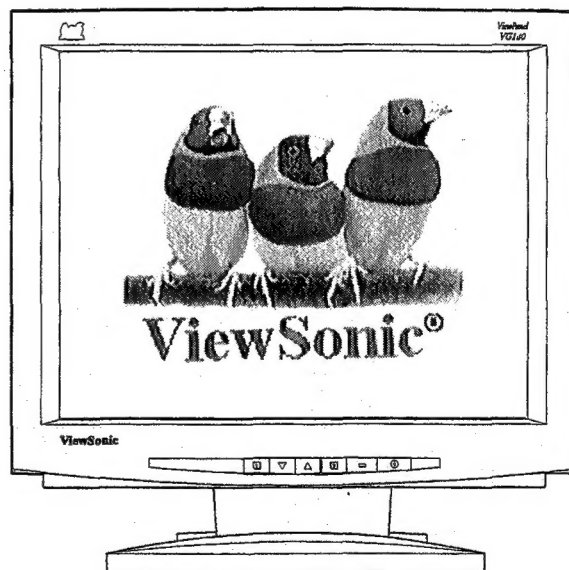


Service Manual

ViewSonic VG150 ViewPanel™ Model No. VLCDS21457-1

15" Active Matrix LCD Color Monitor



(Rev. 1 – April 1999)

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Revision History

Revision	Date	Description Of Changes	Approval
1.0	4/29/99	Initial Issue	T. Sears

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FCC INFORMATION

This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that the interference will not occur in a particular installation. If this equipment does cause unacceptable interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures -- reorient or relocate the receiving antenna; increase the separation between equipment and receiver; or connect the into an outlet on a circuit different from that to which the receiver is connected.

FCC WARNING

To assure continued FCC compliance, the user must use a grounded power supply cord and the provided shielded video interface cable with bonded ferrite cores. Also, any unauthorized changes or modifications to Amtrak products will void the user's authority to operate this device. Thus AmTRAN will not be held responsible for the product and its safety.

CE CERTIFICATION

This device complies with the requirements of the EEC directive 89/336/EEC with regard to "Electromagnetic compatibility."

SAFETY CAUTION

Use a power cable that is properly grounded. Always use the AC cords as follows -- USA (UL); Canada (CSA); Germany (VDE); Switzerland (SEV); Britain (BASEC/BS); Japan (Electric Appliance Control Act); or an AC cord that meets the local safety standards.

Features

The VG150 are world class TFT LCD analog display monitors that include the following features.

1. **Digital On Screen Display Controls**
User friendly buttons (Power, Function, Select (+ / -), Auto) allowing for picture perfect quality. User can define display mode or reset to default settings. Help menu contains: Auto-Sync; Contrast; Brightness; OSD H-Pos; OSD V-Pos; Color; LCD Adjust; MISC and Exit.
2. **Power Supply Support**
Ability to accept voltages from 100~240 Vac (Universal), thus allowing a full range of input AC power supply.
3. **Power Saving System**
This environmental friendly product is able to reduce power consumption by 75% in Suspend Mode and by more than 95% in Off Mode.
4. **Frequency Range**
Monitor can support video standards from VGA to XGA, where Horizontal frequency ranges from 30~62kHz and Vertical frequency ranges from 50~75 Hz.

SPECIFICATIONS

Characteristic	Description
LCD Panel	ADI, 15.0 inch diagonal viewable screen, Anti-glare TFT Active Matrix Panel, 0.297 mm pixel pitch, TDK Inverter
Maximum Viewing Angles	Left : 60° Right : 60° Up : 45° Down : 55°
Signal Input	Video : RGB analog, 0.7 Vp-p, 75 ohms Sync : H/V separate or composite sync, TTL Horizontal : 30~62 kHz Vertical : 50~75 Hz
Connector	15 Pin Mini D-Sub
Maximum Resolution	1024x768
Video Bandwidth	100 MHz nominal
Display Area	304.1mm (H) x 228.1mm (V)
Power Voltage	100~240Vac @ 50 ~ 60 Hz (auto switch), 12Vdc 3A
Power Consumption	38 W max.
Operating Conditions	Temperature : 32° to 104° (0° to 40°) Humidity : 10% to 90% (no condensation) Altitude : To 10,000 feet
Storage Conditions	Temperature : -4° to +140° (-20° to +60°) Humidity : 10% to 90% (no condensation) Altitude : To 10,000 feet
Dimensions	Physical : 390mm (W) x 372mm (H) x 138mm (D)
Weight	5.0 kg

ON SCREEN DISPLAY

OSD (On Screen Display) function is supported on each the TFT LCD analog display monitors and is controlled by four easy to use buttons – Power, Function, Select (+), Select (-), Auto.

Function	Sub-Function	Value
Auto Sync		
Contrast		0 ~ 100
Brightness		0 ~ 100
OSD H-POS		0 ~ 100
OSD V-POS		0 ~ 100
Color	Preset 1	
	Preset 2	
	Red	0 ~ 100
	Green	0 ~ 100
	Blue	0 ~ 100
LCD Adjust	H Size	0 ~ 100
	H Position	0 ~ 100
	V Position	0 ~ 100
	Fine Tune	0 ~ 100
	Auto sync	
MISC	Invisible	ON/OFF
	Smoothing	ON/OFF
	Information	
	Language	
	Recall	
Exit	Main menu	

FACTORY PRESET TIMINGS

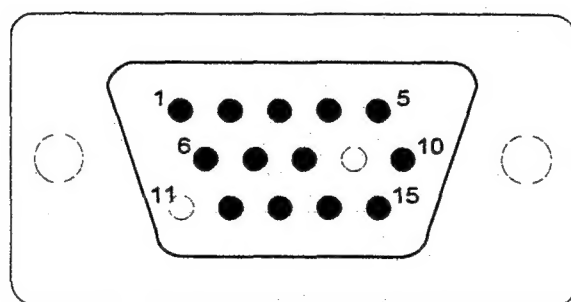
This timing chart is already preset for the TFT LCD analog display monitors.

Timing	Horizontal Polarity	Horizontal Frequency	Vertical Polarity	Vertical Frequency
VGA 640x350	+	31.47 kHz	-	70.08 Hz
VGA 720x400	-	31.46	+	70.08
VGA 640x400	-	31.46	-	70.08
VGA 640x480	-	31.47	-	60.05
VESA 640x480	-	37.86	-	72.81
VESA 640x480	-	37.50	-	75.00
MAC 640x480	-	35.00	-	66.66
VESA 800x600	+	35.15	+	56.25
VESA 800x600	+	37.87	+	60.31
VESA 800x600	+	48.07	+	72.18
VESA 800x600	+	46.87	+	75.00
VESA 1024x768	-	48.36	-	60.00
VESA 1024x768	-	56.47	-	70.06
SVGA 1024x768	-	58.03	-	71.91
VESA 1024x768	+	60.02	+	75.02
MAC 1024x768	-	60.24	-	74.92

PIN ASSIGNMENT

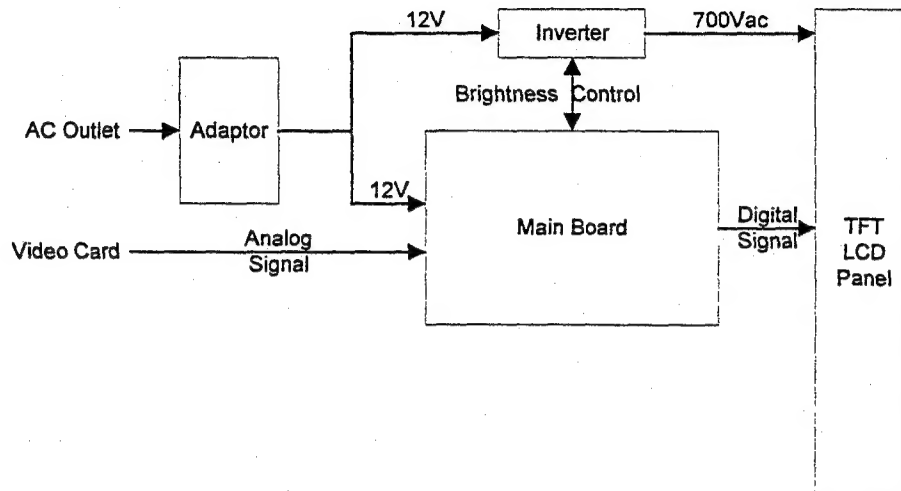
The TFT LCD analog display monitors use a 15 Pin Mini D-Sub connector as video input source.

Pin	Description
1	Red
2	Green
3	Blue
4	Ground
5	Ground
6	R-Ground
7	G-Ground
8	B-Ground
9	No Connection
10	Ground
11	No Connection
12	(SDA)
13	H-Sync (Composite Sync)
14	V-Sync
15	(SCL)

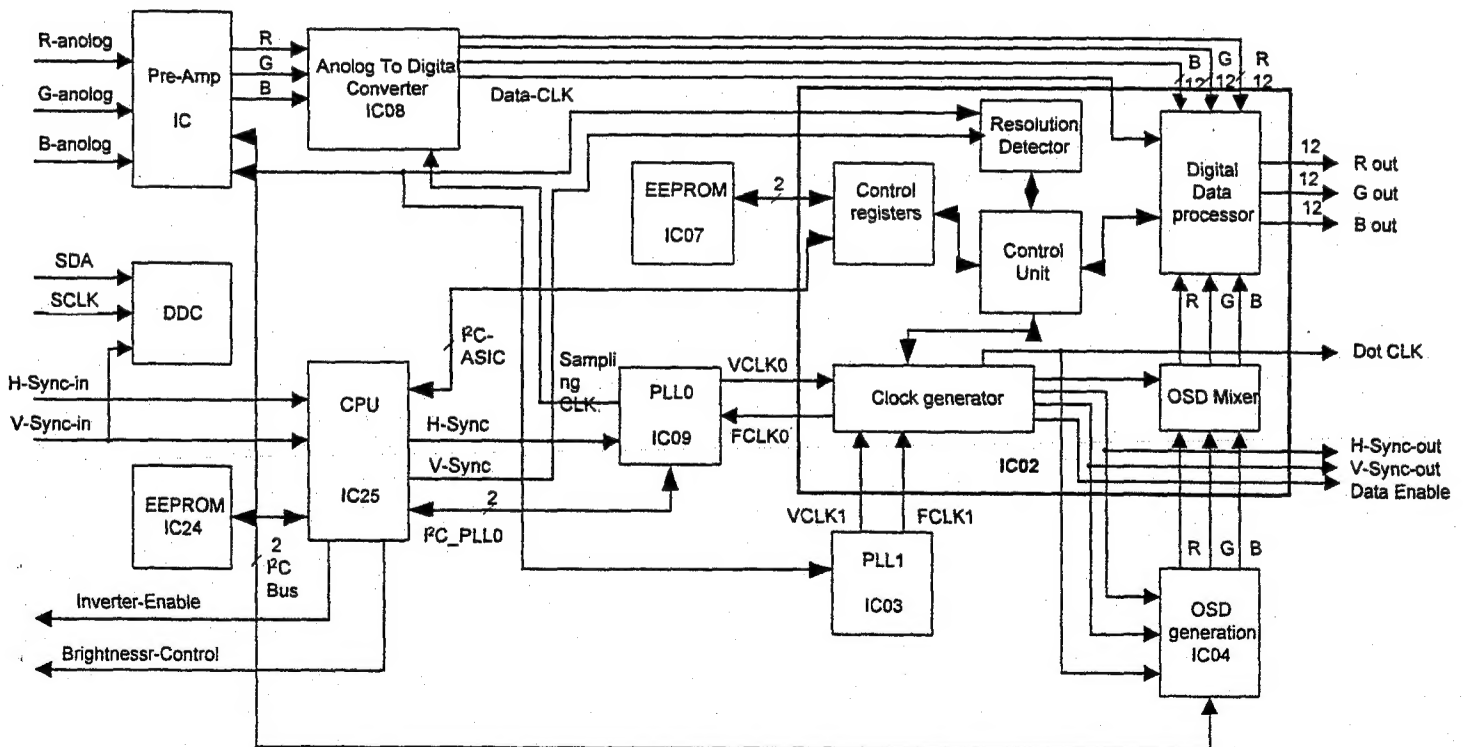


BLOCK DIAGRAM

COMPLETE TFT LCD DISPLAY UNIT



MAIN BOARD (TFT LCD DISPLAY ANALOG INTERFACE CONTROL BOARD)



MAIN BOARD I/O CONNECTIONS

W04 CONNECTION (LEFT□RIGHT) "OSD CONTROL"

Pin	Description
1	"-" Key
2	" Function " Key
3	"+" Key
4	Recall
5	LED 1
6	LED 2
7	Ground
8	Power 1
9	Power 2

W05 CONNECTION (TOP□BOTTOM) "INVERTER CONTROL"

Pin	Description
1	+12V
2	Ground
3	V Enable
4	CON
5	No Connection

MAIN BOARD I/O CONNECTIONS

W07 CONNECTION "VIDEO SIGNAL OUT TO LCD PANEL"

Pin	Description
1	N.C.
2	N.C.
3	N.C.
4	N.C.
5	N.C.
6	N.C.
7	Red Odd Data Signal (LSB)
8	Ground
9	Red Odd Data Signal
10	Red Odd Data Signal
11	Red Odd Data Signal
12	Red Odd Data Signal
13	Red Odd Data Signal
14	Red Odd Data Signal
15	Ground
16	Red Odd Data Signal (MSB)
17	Green Odd Data Signal
18	Green Odd Data Signal (LSB)
19	Green Odd Data Signal
20	Green Odd Data Signal
21	Green Odd Data Signal
22	Green Odd Data Signal
23	Green Odd Data Signal (MSB)
24	Green Odd Data Signal
25	Blue Odd Data Signal (LSB)
26	Ground
27	Blue Odd Data Signal
28	Blue Odd Data Signal
29	Blue Odd Data Signal
30	Blue Odd Data Signal

Pin	Description
31	Blue Odd Data Signal
32	Blue Odd Data Signal
33	Ground
34	Blue Odd Data Signal (MSB)
35	Red Even Data Signal
36	Red Even Data Signal (LSB)
37	Red Even Data Signal
38	Red Even Data Signal
39	Red Even Data Signal
40	Red Even Data Signal
41	Red Even Data Signal (MSB)
42	Red Even Data Signal
43	Green Even Data Signal (LSB)
44	Ground
45	Green Even Data Signal
46	Green Even Data Signal
47	Green Even Data Signal
48	Green Even Data Signal
49	Green Even Data Signal
50	Green Even Data Signal
51	Ground
52	Green Even Data Signal (MSB)
53	Blue Even Data Signal
54	Blue Even Data Signal (LSB)
55	Blue Even Data Signal
56	Blue Even Data Signal
57	Blue Even Data Signal
58	Blue Even Data Signal
59	Blue Even Data Signal (MSB)
60	Blue Even Data Signal

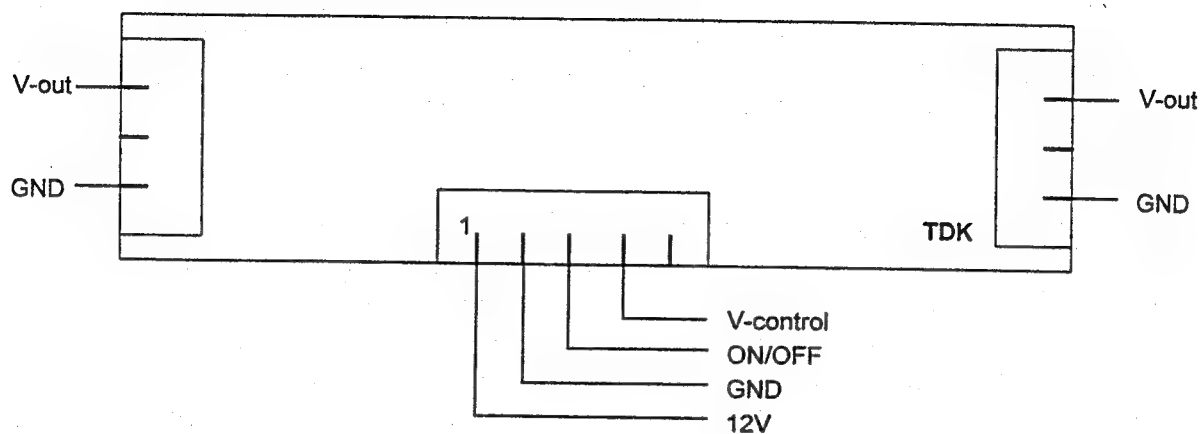
MAIN BOARD I/O CONNECTIONS

W07 CONNECTION "VIDEO SIGNAL OUT TO LCD PANEL"

Pin	Description
61	Ground
62	Ground
63	V Sync Signal
64	Ground
65	Data Enable Signal
66	H Sync Signal
67	Ground
68	Ground
69	Dot Clock
70	Dot Clock

Pin	Description
71	Ground
72	Ground
73	Power of LCD
74	Power of LCD
75	Power of LCD
76	Power of LCD
77	N.C.
78	N.C.
79	N.C.
80	N.C.

INVERTER BOARD I/O CONNECTIONS



NOTE: MANUFACTURER'S NAME MUST BE ON THE PRINTED SIDE FOR THE INVERTER BOARD TO BE FACING UP.

THEORY OF CIRCUIT OPERATION

The VG150 are multi-frequency and multi-mode color TFT LCD monitors. It supports true XGA resolution of 1024x768 including SVGA, VGA and other various high resolution modes up to 1024x768 for IBM, PC compatibles, Power PC and Macintosh. The TFT LCD panel, with a 0.288 mm pixel pitch, provides sharp flicker-free images.

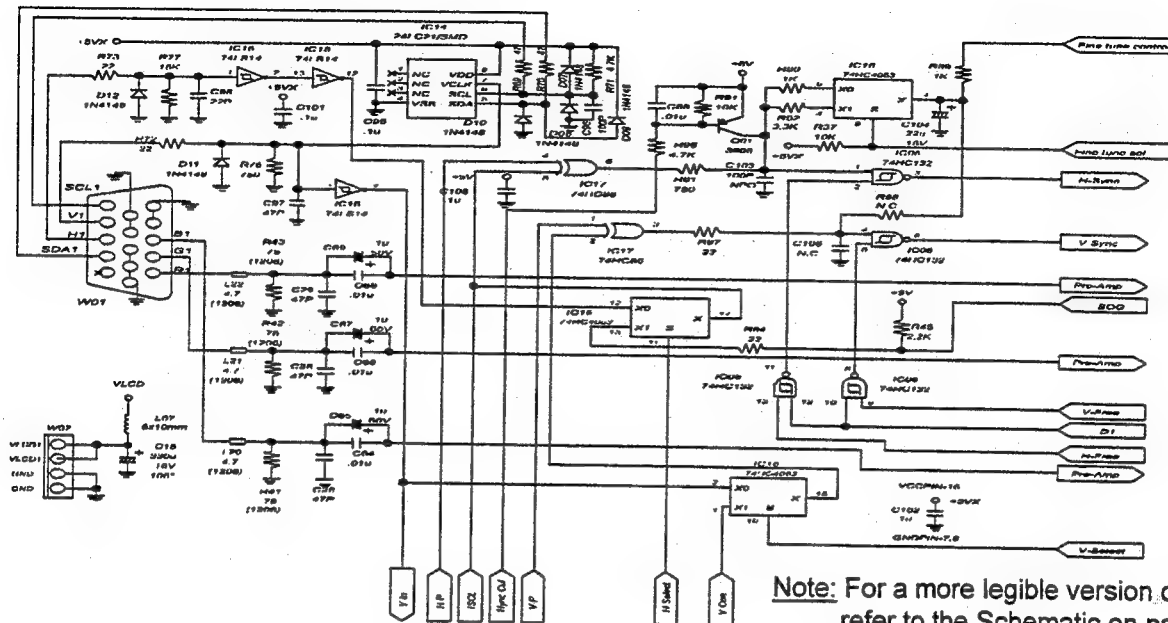
As the previous block diagram illustrates, the VG150 uses the Analog Interface Controller (IC20) ASIC for mode detection and resolution amplifying from its preset values. The purpose of the two set of PLL is to provide the clock from multiple horizontal synchronous frequencies. PLL0 provides A/D converter's sample clock with the ICS1523 (IC09) while PLL1 produces the LCD panel's dot clock with the TLC2933 (IC03).

Furthermore, each TFT LCD monitor uses the 24LC21 (IC14) chip to provide DCC1™ and DCC2B™ with Plug&Play. Also included in each monitor is a mode detection feature to examine the H-Sync frequency input level to decide for power saving mode. Power saving will shut down certain components, including excess electrical power to reduce power consumption.

Upon receiving video signal input, the Analog Interface Controller (Digital Process and Control System) will trigger the mode detection function such that the internal controls can use the ROM's preset information to drive the Analog Interface Controller. In addition, the preset values can determine A/D converter clock; LCD dot clock; line buffer input/output rate; V-Sync and H-Sync pulse width; back porch and front porch to provide optimal performance for the TFT LCD monitors.

Digital process and control system allows users to control OSD menu values to change monitor settings that includes audio volume, contrast, brightness, color, H/V position, and H size. The following sections are a breakdown of the TFT LCD display control board's major sections.

THEORY OF CIRCUIT OPERATION



Note: For a more legible version of this drawing, refer to the Schematic on page 59.

This product uses 74HC4053 as a signal switch in order to support Composite SYNC and SYNC on Green timings. The MPU(IC25) in this product provides the differentiation function to the Composite SYNC, so the SYNC processor circuit is simplified. The free run function in this product also make user to easily know the input signal is out of product specification or interrupted. When separated SYNC is detected through the V-in and H-in, MPU will set both the H-select and V-select to low level. If the composite SYNC is detected, the H-select is low level and V-select will be high level. If the SOG is detected, both H-select and V-select are in high level.

V-com is the vertical SYNC separated from the Composite SYNC through MPU. If the input signal is out of specification or interrupted, the free run mode will be activated. The free run SYNC comes from the pin 39 and 40 of IC02.

At this condition, the Hsync-cut is low level and the pin 1 of IC06 is always high level.

Above condition plus the condition that the free run enable is also in high level, the V-free and H-free will activate the free run mode.

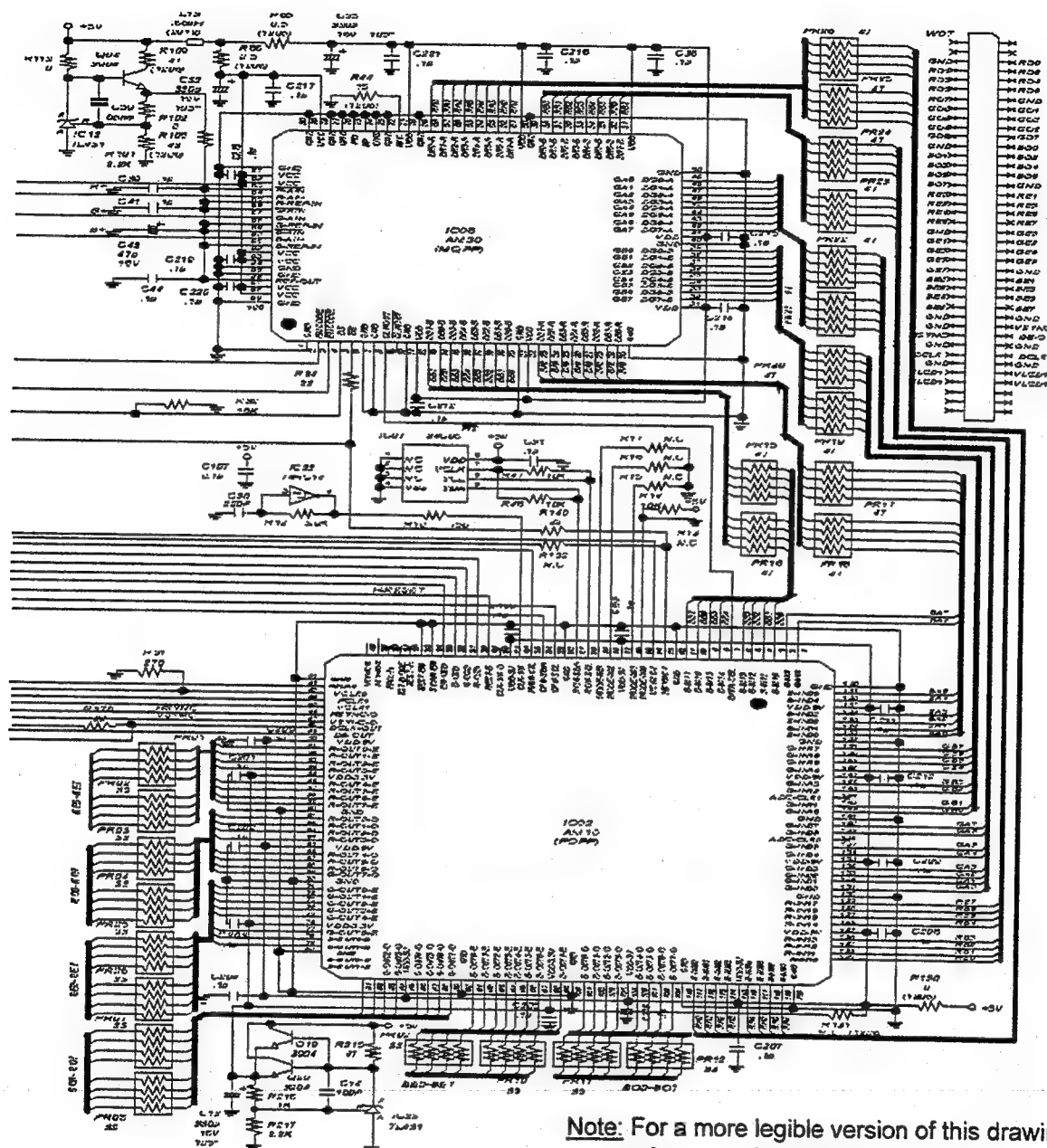
THEORY OF CIRCUIT OPERATION

This product supports timing from VGA to XGA, so the pixel rate is from 25 MHz to 80 MHz. In order to make the phases of sampling clock and video to be closed to each other easily and precisely when user uses the find tune function, the phase delay effect in the high pixel rate is smaller than that in the low pixel rate. The MPU will choose the proper phase adjustment circuit through the pin 4 of IC25, fine tune select.

The fine tune control is a PWM signal. When I²C changes the control register the MPU also changes the fine tune control duty cycle. The changed duty cycle will become DC level through R89 and C104. When detecting pixel rate larger than 50 MHz, the MPU will set the fine tune select to high level. If the pixel rate is smaller than 50 MHz, the fine tune select will set to low level. The R52, R59, R80 and C103 are all phase adjustment components.

This product supports DDC 1/2B by using 24LC21. The 24LC21 is a 128x 8 bits EEPROM. This chip is designed to use in applications requiring storage and serial transmission of configuration and control information. Two modes of the operation have been implemented, the Transmit Only mode and Bi-Directional mode. Upon power up, this device will be in the Transmit Only mode, sending a serial bit stream of the entire memory array contents, clocked by the VCLK pin. A valid high to low transition on the SCL pin will cause the device to enter the Bi-Directional mode with byte selectable read/write capability of the memory array.

THEORY OF CIRCUIT OPERATION



Note: For a more legible version of this drawing, refer to the Schematic on page 59.

AM30 is a triple 8-bits A/D converter optimized for XGA LCD monitor with maximum sample rate of 96 MSPS. It can support both single-channel and dual-channel digital outputs. The analog input range of AM30 is (0.6V ~ 2.6 V). The external top reference voltage (2.6V) and bottom reference voltage (0.6V) reference voltage is required. AM100 is a highly integrated analog interface. The analog input R.G.B. signals are first sampled by six channels of A/D converter (AM30, choose dual-channel digital output) and the 48-bits R.G.B. data are then fed into

THEORY OF CIRCUIT OPERATION

AM100

The AM100 is capable of performing automatic detection of the display resolution and timing of the input signals generated from various graphic cards. The AM100 then automatically scales the input image to fill the full screen of the LCD monitor. The AM100 can interface with TFT LCD panels from various manufacturers by generating 48-bits R.G.B. signal to the LCD panel based upon the timing parameter saved in the EEPROM (IC07).

The AM100 has the following major functions;

1. Input mode detection.
2. Auto calibration.
3. Image scaling.
4. Image interpolation and dithering.
5. OSD mixer.

The following sections will describe the functions.

Input Mode Detection

The AM100 can automatically detect the mode of the input signal without any user adjustment or driver running on the PC host or external CPU. It automatically detects polarity of input synchronization and the sizes of back porch, valid data window and the synchronization pulses width in both vertical and horizontal directions. The size information is then used not only to decide the input resolution, to generate the frequency driver for the input PLL. To lock with HSYNC, but also to automatically scale the image to full screen, and to synchronize the output signal with the input signal.

The detection logic is always active to automatically detect any changes to the input mode.

Auto Calibration

The AM100 can automatically calibrate the phase of the sample clock in order to preserve the bandwidth of input signal and get the best quality. The AM100 implements a proprietary image quality function. During auto-calibration process, the AM100 continues to search for the best phase to optimize the image quality. The output image may display some jitter and blurring during the auto-calibration process, and the image will become crisp and sharp once the optimum phase is found. User can change the sampling clock phase value by the external CPU. The phase calibration process can be delayed and even disabled by the external CPU if system designer wants to have his/her own implementation. The phase calibration can be independently turned ON or OFF by external CPU. When the calibration is turned OFF, external CPU can change the input mode and frequency definitions.

THEORY OF CIRCUIT OPERATION

Image Scaling

The AM100 supports several different input modes, and the input image may have different sizes. It is essential to support automatic image scaling so that the input image is always displayed to the full screen regardless the input mode. The AM100 scale the images in both horizontal and vertical directions. It calculates the correct scaling ratio for both directions based upon the LCD panel resolution, and the input mode and timing information produced by the input mode detection & auto calibration function. The scaling ratio is re-adjusted whenever a different input mode is detected. The ratio is then fed to the buffer memory read control logic to fetch the image data with the right sequence and timing. Some of the image data may be read more than once to achieve scaling effect.

Image Interpolation

The AM100 supports image interpolation to achieve better image quality. A basic image scaling algorithm replicates the input images to achieve the scaling effect. The replication scheme usually results in a poor image quality. The AM100 implements both bi-linear interpolation and a proprietary programmable interpolation algorithm. The programmable interpolation is implemented with a 256-entry mapping table in the EEPROM to allow system user to adjust the bi-linear interpolation parameters to control the sharpness and smoothness quality of the image. In the default setting, the mapping table contains a straight line of slope equal to 1, i.e. the data in entry N equal to the value N. If the mapping table contains a line of slope equal to 2, then the output image will be a bit sharper than image generated by a table with the default setting.

Dithering

The AM100 supports 16.7 million true colors for 6-bit panel. Two dithering algorithms are implemented and again users can choose between them through the external micro-controller. The first one is area-based dithering, and the second one is a frame-based frame modulation, or called frame rate control. Through external micro-controller, users can choose among different dithering algorithm.

OSD mixer and LCD interface

At the output stage, the AM100 performs the OSD mixer function, and then generates 24-bit / 48 bit RGB signal to the LCD panel with the correct timing.

THEORY OF CIRCUIT OPERATION

OSD mixer

In the OSD mixer block, the AM100 mixes the normal output RGB signal with the OSD signal. The OSD output data is generated based on the R_OSD G_OSD and B_OSD pins as well as the OSD Intensity data in EEPROM entry. When the EN_OSD is active high, the OSD is active, and the AM100 will send the OSD data to the LCD panel. The OSD has 16 different color schemes based on the combinations of the three OSD color pins and the OSD Intensity data. When R_OSD=1, OSD_Intensity=0, the AM100 will output 128 to the output red channel, R_OUT. When R_OSD=1, and OSD Intensity=1, the AM100 will output 255. The same scheme is used for G-OSD to G-OUT and for B-OSD to B_OUT.

EEPROM interface

As mentioned in previous sections, the external EEPROM stores much crucial information for the AM100 internal operations. The AM100 interfaces with the EEPROM through a 2-wire I²C serial interface. The suggested EEPROM device is an industry standard serial-interface EEPROM (24x08). The I²C interface scheme is briefly described here and detail description can be found in many public literatures.

Input Mode Dependent Data

Symbol	W	640 x 350	640 x 400	720 x 400	640 x 480	800 x 600	1024 x 768	Description
VPW	11	00H 01H	20H 21H	40H 41H	60H 61H	80H 81H	A0H A1H	LCD VSYNC pules width
VBP	11	02H 03H	22H 23H	42H 43H	62H 63H	82H 83H	A2H A3H	LCD VSYNC back porch (including VPW)
VBP source	11	04H 05H	24H 25H	44H 45H	64H 64H	84H 85H	A4H A5H	LCD VSYNC back porch (source equivalent) =VBP * Line Expansion and round up
Target Skip Pixel	11	06H 07H	26H 27H	46H 47H	66H 66H	86H 87H	A6H A7H	If VBP can not be converted into source evenly, the leftover is converted into number Of pixels
VSIZE	11	08H 09H	28H 29H	48H 49H	68H 69H	88H 89H	A8H A9H	LCD number of line
HPW	11	0AH 0BH	2AH 2BH	4AH 4BH	6AH 6BH	8AH 8BH	AAH ABH	LCD HSYNC pules width

THEORY OF CIRCUIT OPERATION

Symbol	W	640 x 350	640 x 400	720 x 400	640 x 480	800 x 600	1024 x 768	Description
HBP	11	OCH ODH	2CH 2DH	4CH 4DH	6CH 6DH	8CH 8DH	ACH AD	LCD HSYNC back porch (including HPW)
HSIZE	11	OEH OFH	2EH 2FH	4EH 4FH	6EH 6FH	8EH 8FH	AEH AFH	LCD number of columns
HTOTAL	11	10H 11H	30H 31H	50H 51H	70H 71H	90H 91H	B0H B1H	LCD total number of pixels per line including all porches
HTOTAL Source	12	12H 13H	32H 33H	52H 53H	72H 73H	92H 93H	B2H B3H	LCD total number of clocks per line (source equivalent) =HTOTAL/Line Expansion
Line Expansion	4	14H [6:3]	34H [6:3]	54H [6:3]	74H [6:3]	94H [6:3]	B4H [6:3]	Vertical source to destination scaling factor 0: 1 to 1 1: 2 to 3 2: 3 to 4 3: 5 to 8 4: 15 to 32 5: 25 to 32 6: 25 to 48 7: 25 to 64 8: 75 to 128 9: 175 to 384 10: 175 to 512
Pixel Expansion	3 [2:0]	14H [2:0]	34H [2:0]	54H [2:0]	74H [2:0]	94H [2:0]	B4H [2:0]	Horizontal source to destination scaling factor 0: 1 to 1 1: 2 to 4 2: 4 to 5 3: 25 to 36 4: 5 to 8 5: 9 to 10 6: 45 to 64 7: 9 to 16
Fog Factor Horizontal	8	15H	35H	55H	75H	95H	B5H	Horizontal fogging factor
Fog Factor 2X	8	16H	36H	56H	76H	96H	B6H	Double of Horizontal fogging factor

THEORY OF CIRCUIT OPERATION

Symbol	W	640 x 350	640 x 400	720 x 400	640 x 480	800 x 600	1024 x 768	Description
Fog Factor Vertical	8	17H	37H	57H	77H	97H	B7H	Vertical fogging factor
Minimum input lines	11	18H	38H	58H	78H	98H	B8H	Minimum input lines =(VSIZE + VBP)*Line Expansion When the input has fewer lines than this value, it is considered as an ERROR, and INPUT_X status bit will be HIGH.
Maximum Input pixels	11	1AH 1BH	3AH 3BH	5AH 5BH	7AH 7BH	9AH 9BH	BAH BBH	Maximum input pixels per line. Auto clock recovery will not set input PLL divisor larger than this value.
Source HSIZE[11:8]	3	1CH [6:4]	3CH [6:4]	5CH [6:4]	7CH [6:4]	9CH [6:4]	BCH [6:4]	Source horizontal size upper 3 bits
Source HSIZE[11:8]	3	1CH [2:0]	3CH [2:0]	5CH [2:0]	7CH [2:0]	9CH [2:0]	BCH [2:0]	Source vertical size upper 3 bits
Source HSIZE[7:0]	8	1DH	3DH	5DH	7DH	9DH	BDH	Source horizontal size lower 8 bits
Source VSIZE[7:0]	8	1EH	3EH	5EH	7EH	9EH	BEH	Source vertical size lower 8 bits
Check sum	8	1FH	3FH	5FH	7FH	9FH	BFH	Sum of above 31 bytes(keep lower 8 bits only)

Input Mode Detection Data

Symbol	Width (bits)	Address	Description
7	8	120H	Low water mark for valid data If the data is smaller than this threshold, it is considered LOW internally
Data high threshold	8	121H	High water mark for valid data If data is larger than this threshold, it is considered HIGH internally
Edge threshold	8	122H	Minimum difference between the data value of two adjacent pixels to be considered as an edge

THEORY OF CIRCUIT OPERATION

Input Mode Detection Data

Symbol	Width (bits)	Address	Description
Calibration mode	2	123H [1:0]	This is to select different operation modes of internal phase calibration. The selection criterion is as follow: 0:when input video signal has overshoot, it results in longest calibration time 1:when input video signal has median overshoot, it results in long calibration time 2:when input video signal has normal overshoot, it results in normal calibration time (recommended) 3:when input video signal has no overshoot, it results in shortest calibration time
Res0 threshold	10	124H-125H	Upper bound of the line number for 640x350 mode, and lower bound for 640x400
Res1 threshold	10	126H	Upper bound of the line number for 640x400 mode, and lower bound for 720x400
Res2 threshold	10	128H-129H	Upper bound of the line number for 720x400 mode, and lower bound for 640x480
Res3 threshold	10	12AH-12BH	Upper bound of the line number for 640x480 mode, and lower bound for 800x600
Res4 threshold	10	12CH-12DH	Upper bound of the line number for 800x600 mode, and lower bound for 1024x768
Res5 threshold	10	12EH-12FH	Upper bound of the line number for 1024x768 mode, and lower bound for 1280x1024
Res6 threshold	10	130H-131H	Upper bound of the line number for 1280x1024 mode. If the input has more line than this threshold, it is considered INVALID mode
Mode 640x350 Sync Polarity	2	132H[1:0]	The polarity of input synchronization signals Bit 0 is for VSYNC and bit 1 is for HSYNC
Mode 640x400 Sync Polarity	2	132H[3:2]	The polarity of input synchronization signals Bit 0 is for VSYNC and bit 1 is for HSYNC
Mode 720x400 Sync Polarity	2	132H[5:4]	The polarity of input synchronization signals Bit 0 is for VSYNC and bit 1 is for HSYNC
Mode 640x480 Sync Polarity	2	132H[7:6]	The polarity of input synchronization signals Bit 0 is for VSYNC and bit 1 is for HSYNC

THEORY OF CIRCUIT OPERATION

Symbol	Width (bits)	Address	Description
Mode 800x600 Sync Polarity	2	133H[1:0]	The polarity of input synchronization signals Bit 0 is for VSYNC and bit 1 is for HSYNC
Mode 1024x768 Sync Polarity	2	133H[3:2]	The polarity of input synchronization signals Bit 0 is for VSYNC and bit 1 is for HSYNC
Mode 1280x1024 Sync Polarity	2	133H[5:4]	The polarity of input synchronization signals Bit 0 is for VSYNC and bit 1 is for HSYNC
Maximum VBP	8	134H	The maximum vertical back porch for input video
PWM unit delay	13	135H-136H	The unit delay used in the external PWM delay circuitry. If the Free-running clock is 1MHz, and the intended unit delay is 0.2 ns (= 5,000MHz) , then a value of 5,000MHz/1MHz =5,000 is used here.
Maximum link off time	22	137H-139H	Maximum time when input VSYNC is off before the LINK_DWN pin turns ON (unit: clock period of the free running clock). If the free-running clock is 1MHz, and the intended maximum time is 1 second, then a value of 1,000,000 us / 1us = 1,000,000 is used here.
Maximum refresh rate	16	13Ah-13BH	Maximum refresh rate supported by the LCD panel If the intended maximum refresh rate is 75Hz, and the free-running clock is 1MHz, then a value of 1000000/75=133,333 is used here
Maximum input frequency	8	13CH	Maximum source clock rate supported by the AM100 (unit: frequency of free-running clock) If the intended maximum clock rate is 60MHz, and the free-running clock is 1MHz, then a value of 60 is used here. If the input signal has a higher frequency than this value, the VCLK0_X status bit will turn ON.
Scale factor CE	8	13DH	Scale factor used when generate look up table for current even pixel multiplication
Scale factor CO	8	13EH	Scale factor used when generate look up for current odd pixel multiplication
Scale factor NE	8	13FH	Scale factor used when generate look up table for next even pixel multiplication
Scale factor NO	8	140H	Scale factor used when generate look up table for next odd pixel multiplication

THEORY OF CIRCUIT OPERATION

Symbol	Width (bits)	Address	Description
Offset factor CE	8	141H	Offset factor used when generator look up table for current even pixel multiplication
Offset factor CO	8	142H	Offset factor used when generator look up table for current odd pixel multiplication
Offset factor NE	8	143H	Offset factor used when generate look up table for next even pixel multiplication
Offset factor NO	8	144H	Offset factor used when generate look up table for next odd pixel multiplication
Scale factor V	8	145H	Scale factor used when generate look up table for line multiplication
Minimum pixels per line for LCD	11	147H-148H	Minimum number of pixels per line for LCD panel
LCD polarity	4	149H[3:0]	Controls the polarity of output VSYNV, HSYNC, clock and display enable Bit 0:0: clock active high, 1: clock active low Bit 1: 0: HSYNC active low, 1: HSYNC active high Bit 2: 0: VSYNC active low, 1: VSYNC active high Bit 4: 0: de active high, 1: de active low
Check sum	8	14AH	Sum of all part 9 bytes (keep only lower 8 bit)

Horizontal Interpolation Lookup Table

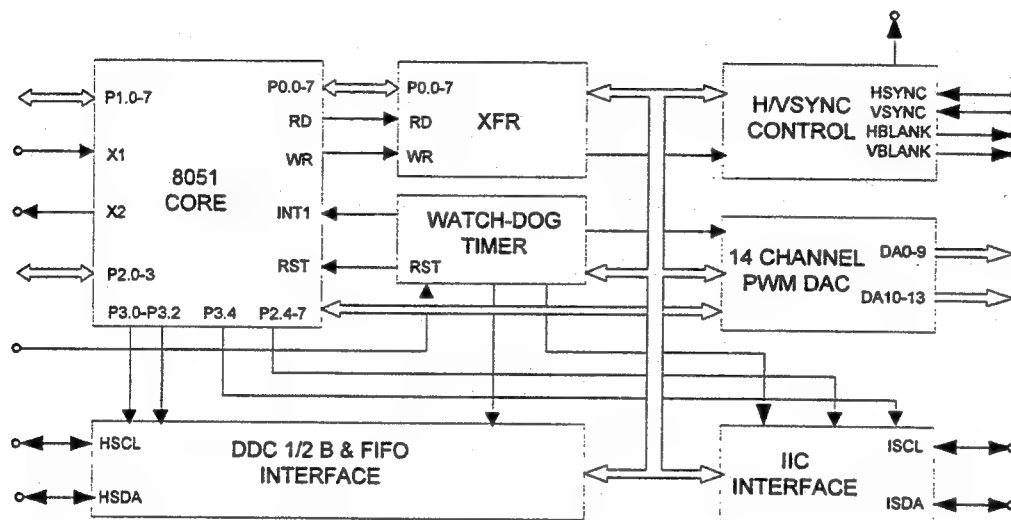
Symbol	Width(bits)	Address	Description
Mapped value	8	IC0H-2BFH	This is the base table for all four horizontal interpolation lookup tables. Each table is then generated by multiply this value With corresponding scale factor and added with corresponding offset factor.
Check sum	8		Sum of all part 10 entry (only keep lower 8 bits)

Vertical Interpolation Lookup Table

Symbol	Width(bits)	Address	Description
Mapped value	8	2E0H-3DFH	This is the table for vertical interpolation lookup table. The vertical interpolation table is then generated by multiply this value with vertical scale factor and added with vertical offset factor
Check sum	8	3E0H	Sum of all part 10 entry (only keep lower 8 bits)

THEORY OF CIRCUIT OPERATION

The MTV112E micro controller is an 8051CPU core embedded device specially tailored to CRT monitor applications. It includes an 8051 CPU core, 256 bytes SRAM, fourteen built-in PWM DACs, DDC1/DDC2B interface, 24Cxx series EEPROM interface, A/D converter and a 32K bytes internal program EPROM.



FUNCTIONAL DESCRIPTIONS

8051 CPU Core

1. The MTV112E includes all the 8051 functions with the following exceptions, PSEN, ALE, RD and WR pins are disabled. The external RAM access is restricted to XFRs within the MTV112E.
2. Port0, port3.3, and port3.5 ~ port3.7 are not general-purpose I/O ports. They are dedicated to monitor control or DAC pins.
3. INT1 and T1 input pins are not provided.
4. Port2.4 ~ port2.7 are shared with DAC pins; port3.0 ~ port3.2 port3.4 are shared with monitor control pins.

In addition, there are 2 timers, 5 interrupt sources and serial interface compatible with the standard 8051. The Txd/Rxd (P3./P3.1) pins are shared with DDC interface. INT0/T0 pins are shared with IIC interface. An extra option can be used to switch the INT0 source from P3.2 to P2.0. This feature maintains an external interrupt source when IIC interface

THEORY OF CIRCUIT OPERATION

The MTV112E pin functions are list below

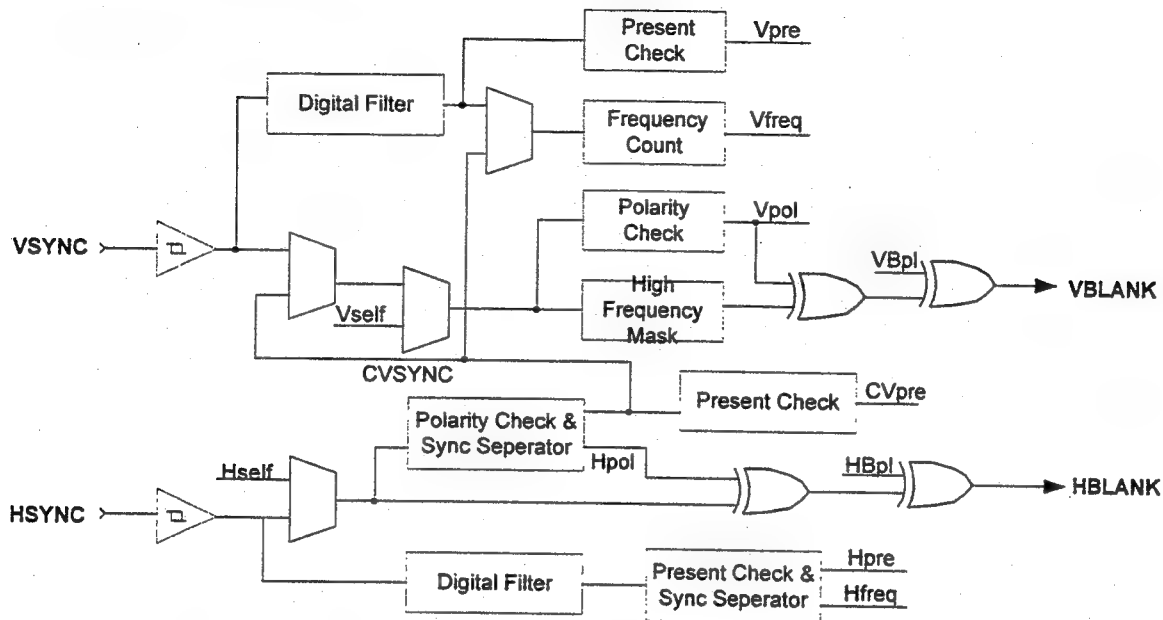
PIN#	Name	TYPE	Description
1	P1.0	I/O	SDA of I ² C for communication with ICS1523
2	P1.1	O	SCL of I ² C for communication with ICS1523
3	P1.2	O	Power switch of +5V and VLCD
4	P1.3	O	Fine tune function select
5	P1.4	O	H-Sync polarity
6	P1.5	O	V-Sync polarity
7	P1.6/ADD	O	Inverter enable
8	P1.7/AD1	O	AM100 Rest signal
9	RST	I	MPU Rest signal
10	HSCL	N.C.	
11	HSDA	N.C.	
12	ISDA	I/O	SDA of I ² C for communication with 24C08, MTV118, M52473
13	HSYNC	I	H-Sync input
14	ISCL	O	SCL of I ² C for communication with 24C08, MTV118, M52473
15	VSYNC	I	V-Sync output
16	HBK/P4.1	N.C.	
17	VBK/P4.0	O	Separated V-Sync signal from composite sync
18	X2	O	Oscillator output
19	X1	I	Oscillator input
20	VSS	-	Negative Power Supply
21	P2.0/INT0	-	Reserve
22	P2.1	I/O	SDA of I ² C for communication with AM100
23	P2.2	I/O	SCL of I ² C for communication with AM100
24	P2.3	-	Reserve
25	D13/P2.4	I	'+' key

THEORY OF CIRCUIT OPERATION

PIN#	Name	TYPE	Description
26	D12/P2.5	I	"1" key
27	D11/p2.6	I	"-" key
28	D10/P2.7	I	"2" key
29	STOUT/P4.2	-	N.C.
30	D9	O	LED 2
31	D8	O	LED 1
32	D7	O	Video offset control
33	D6	-	Reserve
34	D5	O	External H-Sync cutoff control
35	D4	O	Video gain control
36	D3	O	Sync on green /separate or composite select
37	D2	O	V-Sync select (VBK/external V-Sync)
38	D1	O	Free run mode enable
39	D0	O	Power of inverter on/off control
40	VDD	-	Positive Power Supply

THEORY OF CIRCUIT OPERATION

H/V SYNC Processing



The SYNC processing block performs the functions of composite signal separation, sync inputs presence check, frequency counting, polarity detection and control, as well as protection of VBLANK output while VSYNC speed up in high DDC communication clock rate. The preset and frequency function block treat any pulse shorter than one OSC period as noise.

Composite sync separate

The MTV112E continuously monitors the input HSYNC, if the vertical sync pulse can be extracted from the input, a CVpre flag is set and user can select the extracted "CVSYNC" for the source of polarity check, frequency count, and VBLANK. The CVSYNC will have 10-16 us delay compared to the original signal. The delay depends on the OSC frequency and composite mix method.

H/V Polarity Detect

The polarity functions detect the input HSYNC/VSYNC high and low pulses duty cycle. If the high pulses duration is longer than that of low pulse, the negative polarity is asserted; otherwise positive polarity is asserted. The HPLchg interrupt is set when the Hpol value changes. The VPLchg interrupt is set when Vpol value changes.

THEORY OF CIRCUIT OPERATION

H/V Frequency Counter

MTV112E can discriminate HSYNC/VSNC frequency and saves the information in XFRs. The 15 bits Hcounter counts the time of 64XHSYNC period, but only 11 upper bits are loaded into the HCNTL/HCNTL latch.

The 11 bits output value will be $(2/Hfreq) / (1/OSCfreq)$, updated once per VSYNC/CVSYNC period when VSYNC/CVSYNC is present or continuously updated when VSYNC/CVSYNC is non-present. The 14 bits Vcounter counts the time between two VSYNC pulses, but only 9 upper bits are loaded into the VCNTL/VCNTL latch. The 9 bits output value will be $(1/Vfreq) / (512/OSCfreq)$, updated every VSYNC/CVSYNC period. An extra overflow it indicates the condition of H/V counter overflow. The VFchg/HFchg interrupt is active when VCNT/HCNT value changes or overflow.

H/V Present Check

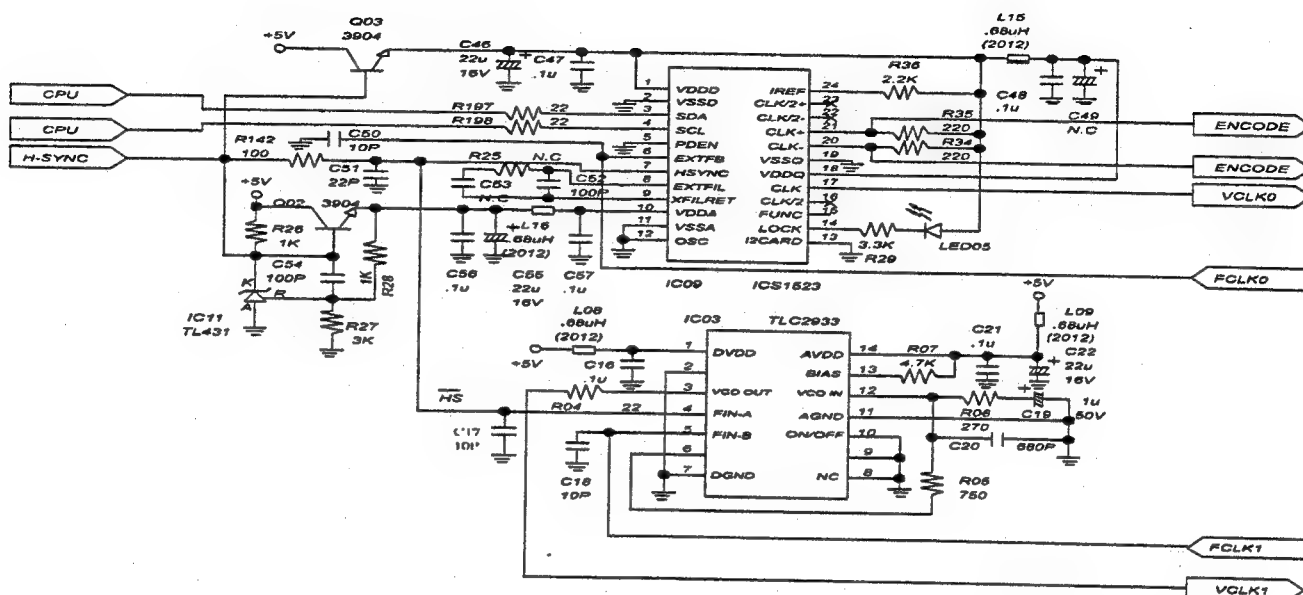
The Hpresent function checks the input HSYNC pulses, Hpre flag is set when HSYNC IS OVER 10KHz or cleared when HSYNC is under 10Hz. The Vpresent function checks the input VSYNC pulses, the Vpre flag is set when VSYNC is over 40Hz or cleared when VSYNC is under 10Hz. Acontrol bit "PREFS" selects the time base for these functions. The HPRchg interrupt is set when the Hpre value changes. The VPRchg interrupt is set when the Vpre/Cvpre value change. However, the Cvpre flag interrupt may be disabled when S/W disable the composite function.

Output HBLANK/VBLANK Control and Polarity Adjust

The HBLANK is the mux output of HSYNC and self-test horizontal pattern. The VBLANK is the mux output of VSYNC, CVSYNC and self-test vertical pattern. The mux selection and output polarity are S/W controllable. The VBLANK output is cut off when VSYNC frequency is over 200Hz or 133Hz depends on 8MHz/12MHz OSC selection. The HBLANK/VBLANK shares the output pin with P4.1/P4.0.

THEORY OF CIRCUIT OPERATION

PLL



The ICS1523 is a high performance frequency generator intended for line-locked and gen-locked high resolution video applications. It offers pixel clock outputs in both differential (to 250MHz) and single-ended (to 150MHz) formats. It is an effective clock solution for video projectors and displays at resolutions from VGA to beyond XGA. The advanced phase-locked loop utilizes either its internal programmable feed-backed divider or an external divider. The device is programmed by a standard I²C – bus™ serial interface. ICS1523 adopts external feedback method to create the sampling clock to provide the A/D converter (AM30). When external divider changes the divisor, the sampling clock frequency is changed.

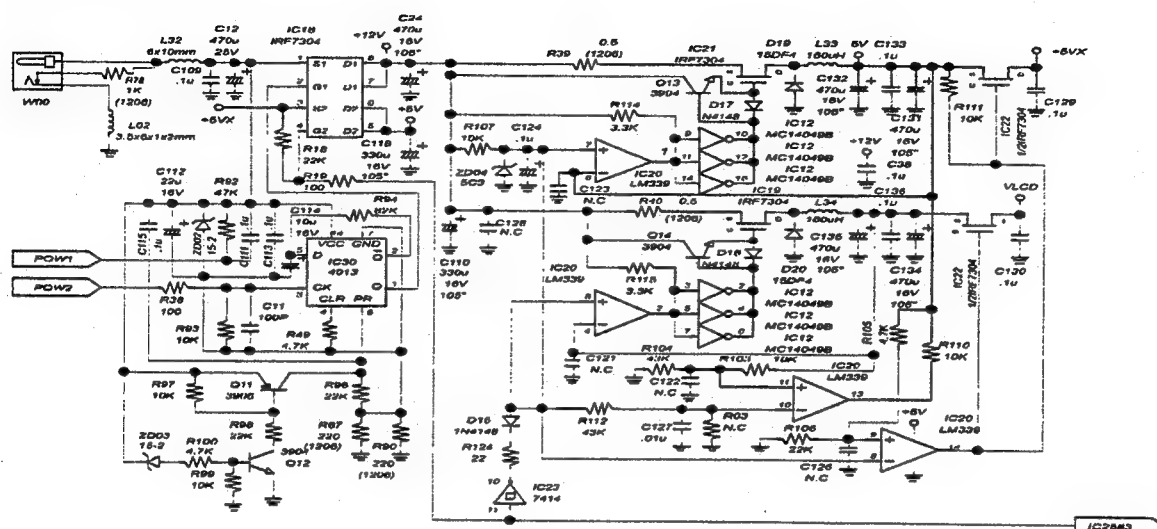
The TLC2933 is designed for phase-locked-loop systems and is composed of a voltage-controlled oscillator (VCO) and an edge-triggered-type phase frequency detector (PFD).

The Oscillator frequency range of VCO is set by an external bias resistor (R07). The high-speed PFD with internal charge pump detects the phase difference between the reference frequency input and signal frequency input from the external divider.

The main purpose of TLC2933 is create the dot clock to the panel.

THEORY OF CIRCUIT OPERATION

POWER SYSTEM



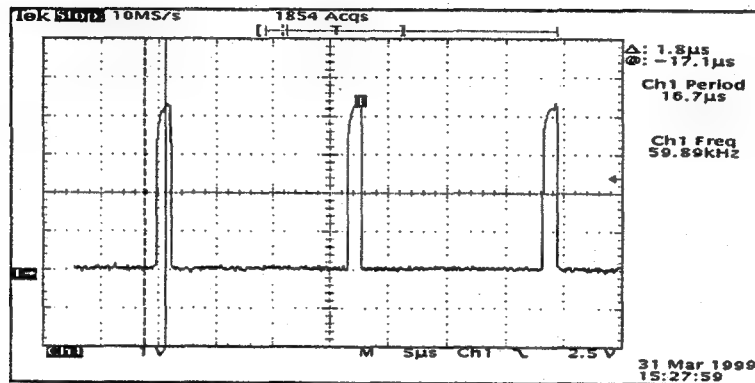
This product uses an external power adapter to provide the DC +12 volts. In order to greatly reduce the power assumption when in power saving stage, the circuit in Fig. 1 is used not only to convert the 12 V to 5 V, but also to control the 5V 's ON/OFF status. IC30(4013) is a D-Flip Flop CMOS and IC18 is a P-Channel MOSFET. When $V_{gs} < 0.7$ V, MOS turns on. As showed in the circuit, when 12 V DC currents enter W09, it creates a pulse through C115 and presets the Flip-Flop. When Q(IC30, pin 1) is in high level, the 12 V could not pass IC18 and the whole system is kept OFF status. When press the power switch, the pin3 of IC30 creates a pulse to force Q to be low level. The pin 7 & 8 is conducted and the 12 V enters the whole system.

There are two regulators that convert the 12 V to 5 V. They are +5Vx and Vlcd. The comparator of IC20 will make the output of two regulators as a feed back to compare with the reference voltage. The compared result will control the IC19 ON/OFF time to achieve the voltage regulation effects. ZD04 will create the reference voltage. Q13, 14 and MC14049 are basically used to speed up the MOSFET ON/OFF switching time in order to reduce IC19 power assumptions. This product also equips with over-voltage protection circuit. When voltage at NO9 is over 15 Volts, Q12 will turn on to make the pin 6 of IC30 always at high level and IC18 will be in off level.

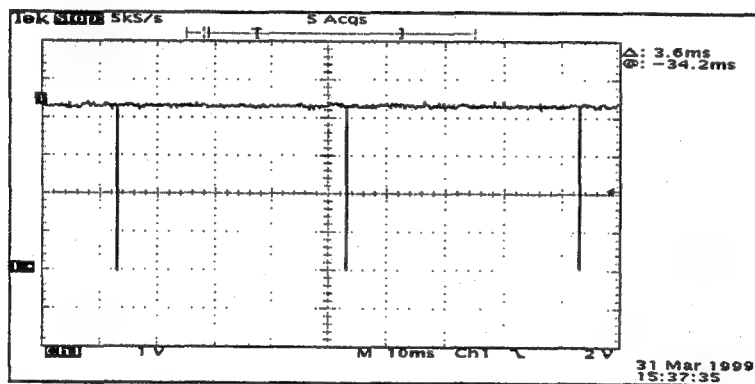
The +5 V and VLCD sources provide most of the required power for the VG150 and LCD panel. When system enters the power saving stage, the above two power sources will turn off through the pin 3 of IC25. The + 5 V source provides power to the CPU and SYNC processor, so it must be isolated from other power sources. When in power saving stage, the pin 3 of IC25 will be set to low level to make the +5 V and VLCD to be cut off.

WAVEFORMS

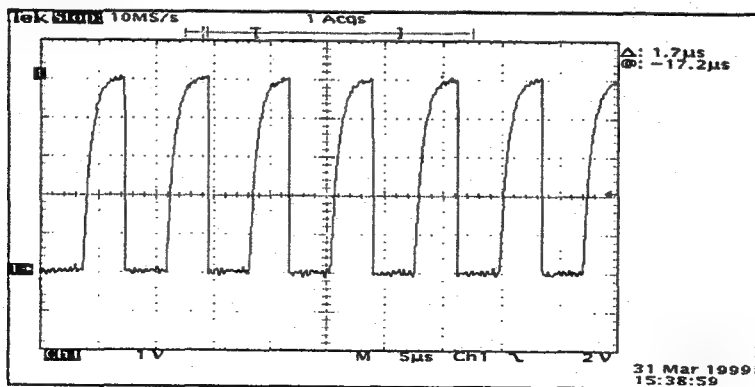
H-SYNC SIGNAL (IC25 AT PIN 3)



V-SYNC SIGNAL (IC25 AT PIN 5)

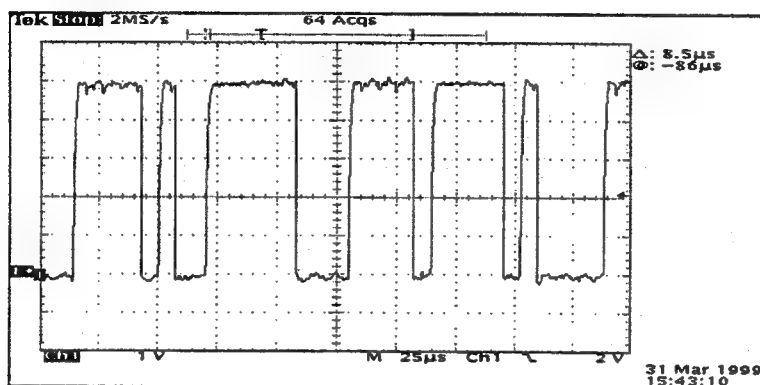


SERIAL CLOCK (IC24 AT PIN 6)

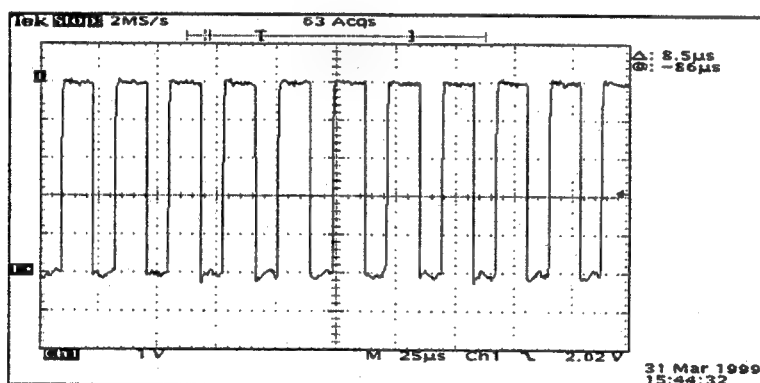


WAVEFORMS

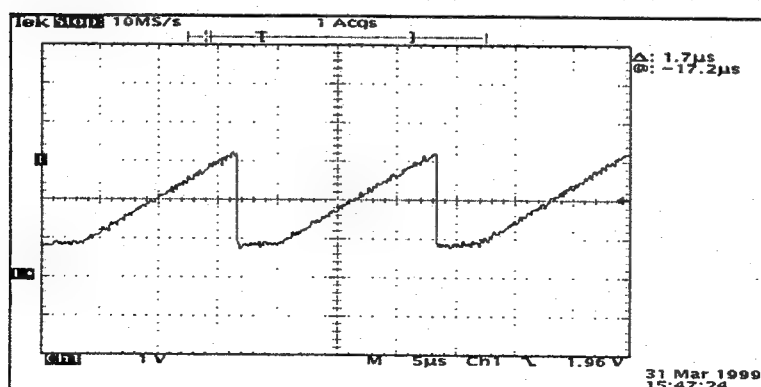
SERIAL DATA (IC24 AT PIN 5)



PWM BRIGHTNESS CONTROL (IC25 AT PIN 39)

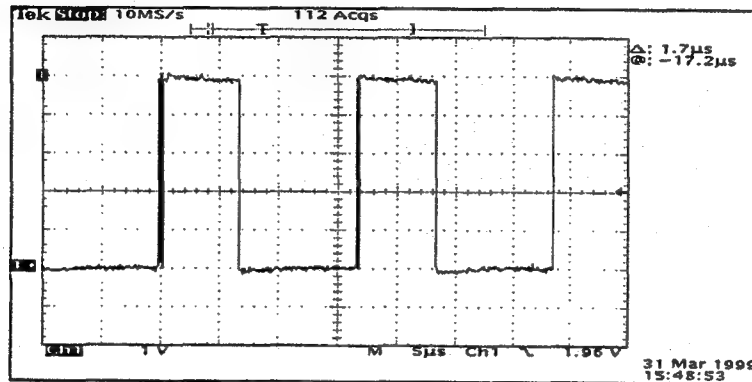


PRE-AMP R-OUT (IC31 AT PIN 35)

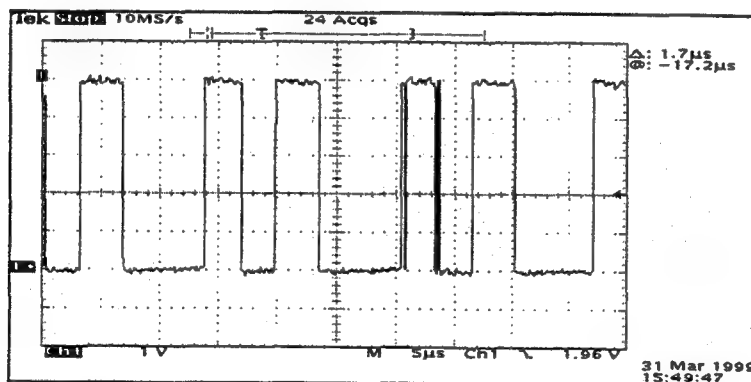


WAVEFORMS

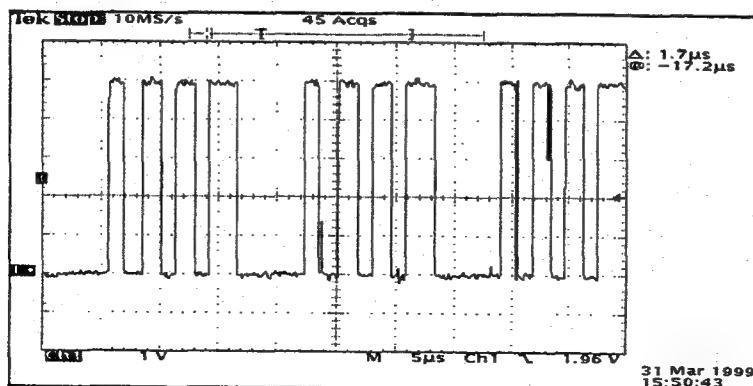
A/D DATA OUTPUT BIT 7 (IC08 AT PIN 52)



A/D DATA OUTPUT BIT 6 (IC08 AT PIN 53)

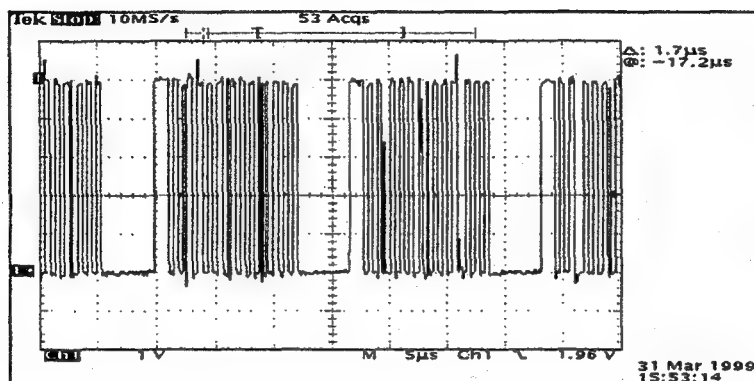


A/D DATA OUTPUT BIT 5 (IC08 AT PIN 54)

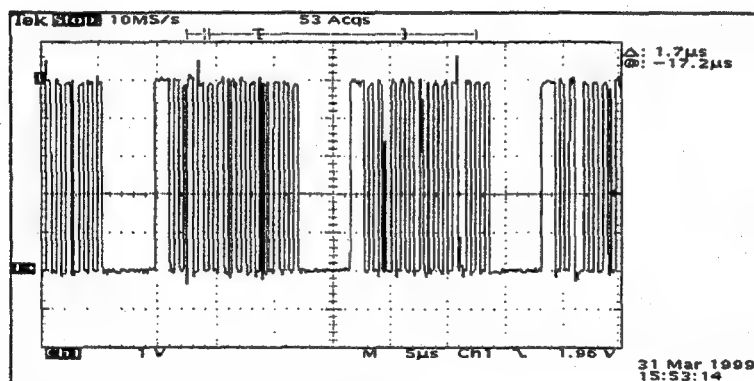


WAVEFORMS

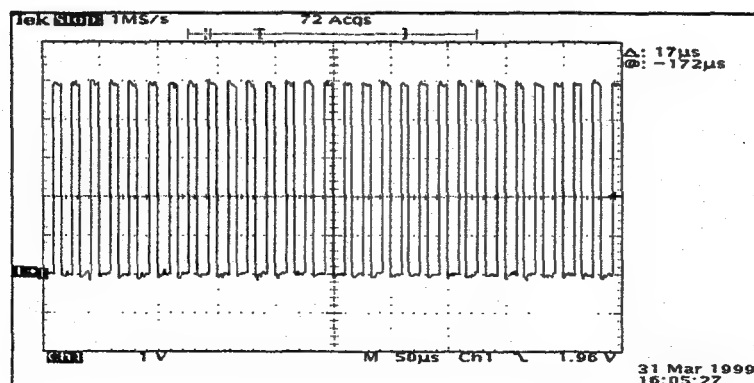
A/D DATA OUTPUT BIT 4 (IC08 AT PIN 55)



A/D DATA OUTPUT BIT 3 (IC08 AT PIN 56)

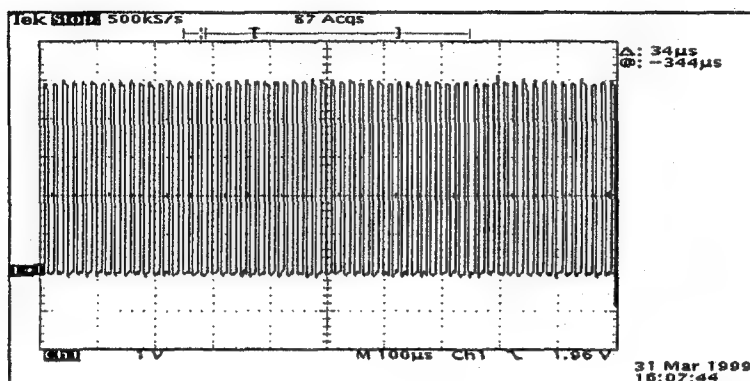


A/D DATA OUTPUT BIT 2 (IC08 AT PIN 57)

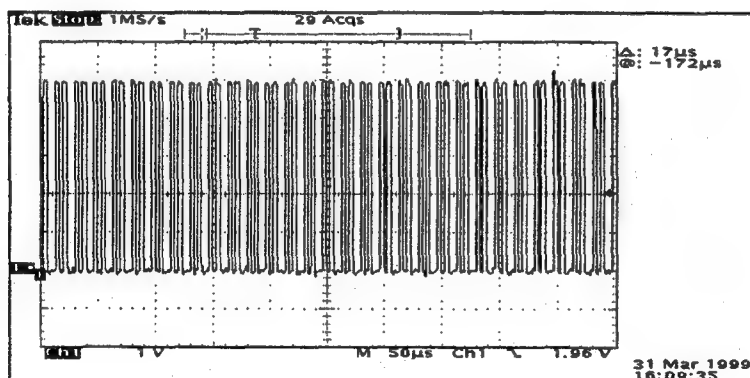


WAVEFORMS

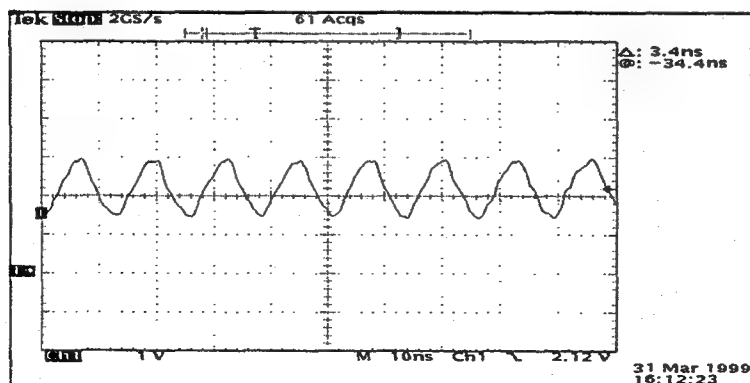
A/D DATA OUTPUT BIT 1 (IC08 AT PIN 58)



A/D DATA OUTPUT BIT 0 (IC08 AT PIN 59)

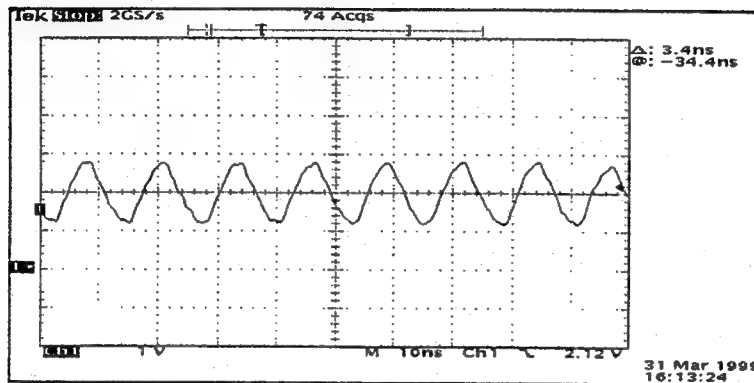


A/D SAMPLE CLOCK 1 (IC08 AT PIN 2)

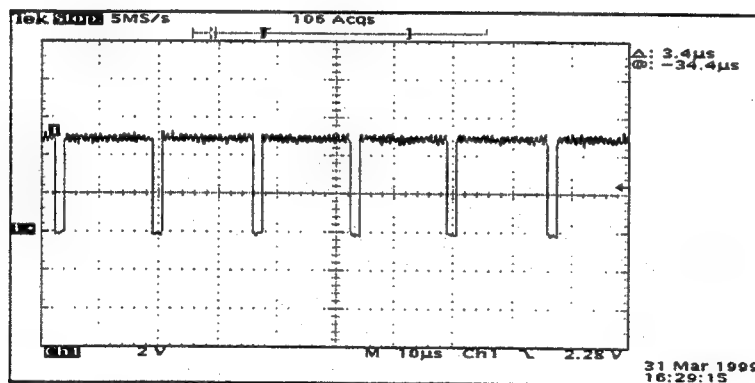


WAVEFORMS

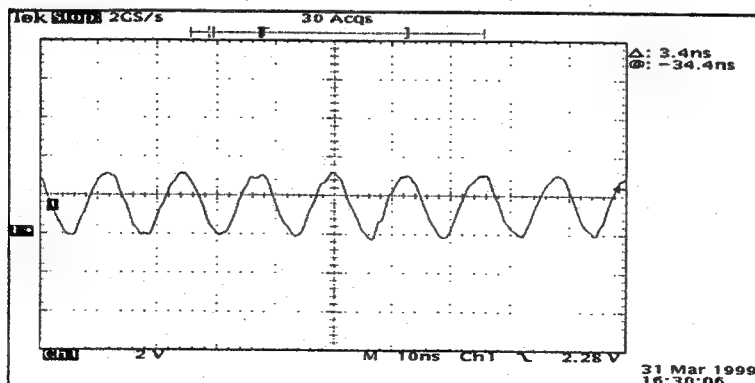
A/D SAMPLE CLOCK 2 (IC08 AT PIN 3)



PLL0 FCLK 0 (IC02 AT PIN 42)

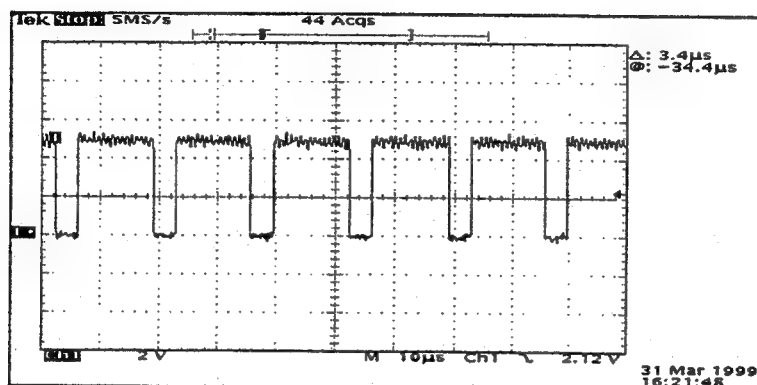


PLL0 VCLK 0 (IC02 AT PIN 43)

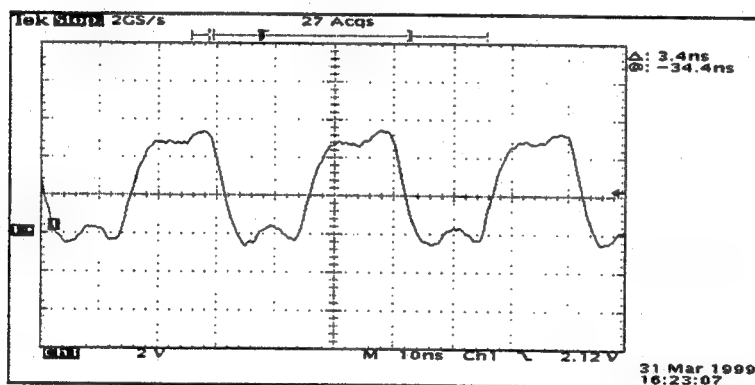


WAVEFORMS

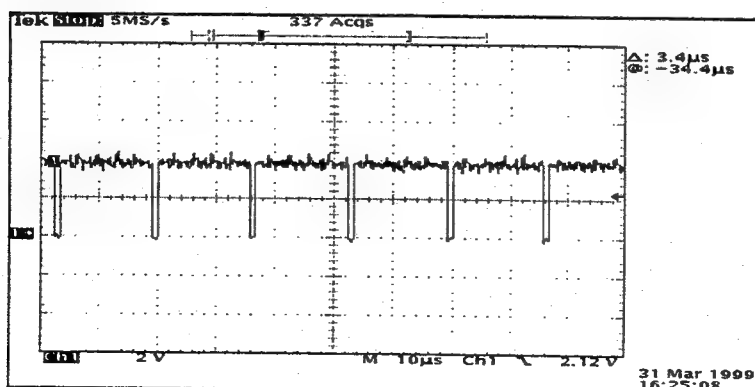
PLL1 FCLK 0 (IC02 AT PIN 44)



PLL1 VCLK 0 (IC02 AT PIN 45)

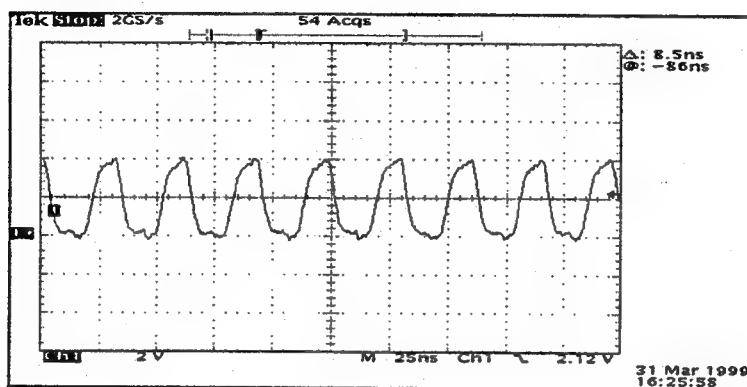


DATA ENABLE (IC02 AT PIN 49)



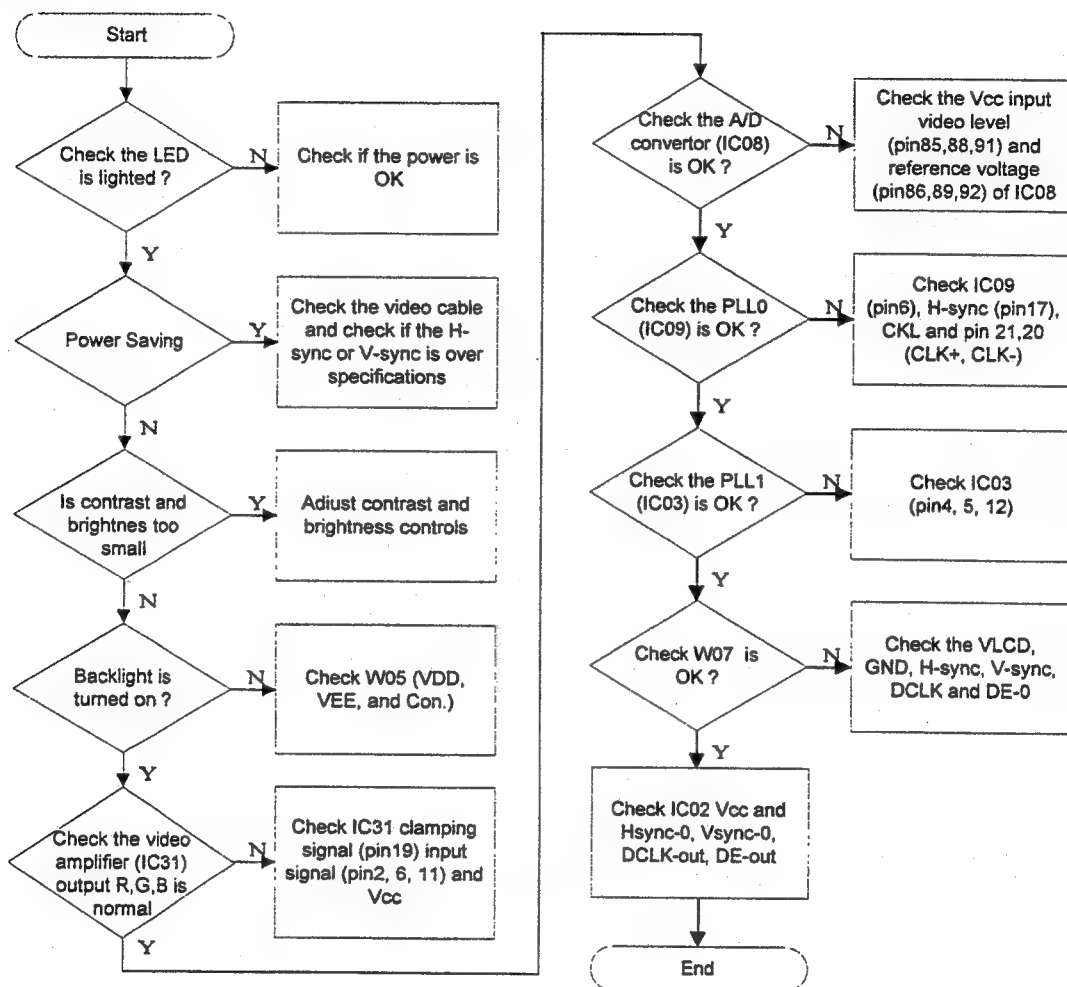
WAVEFORMS

OUTPUT DOT CLOCK (IC02 AT PIN 48)



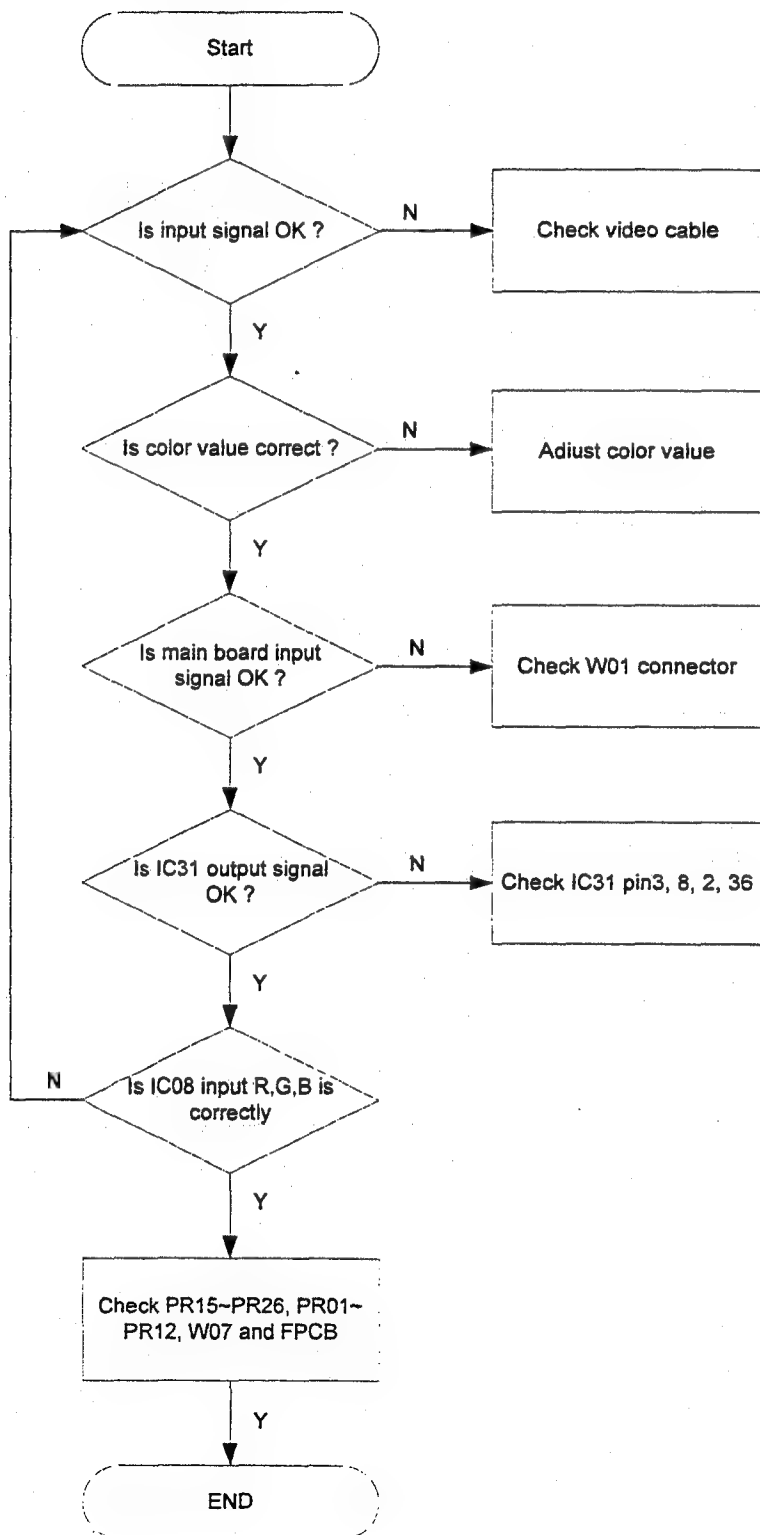
TROUBLE SHOOTING

VIDEO DOES NOT APPEAR



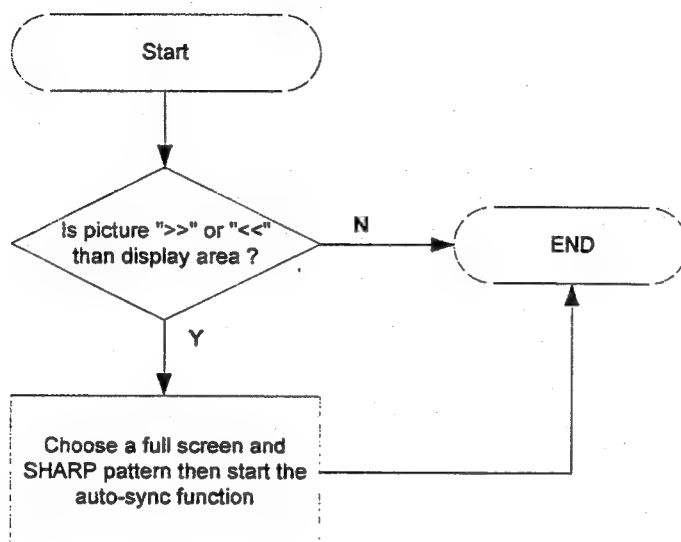
TROUBLE SHOOTING

R, G, B IS NOT DISPLAYED CORRECTLY



TROUBLE SHOOTING

IMPROPER RESOLUTION



SPARE PARTS LIST

PART NO	DESCRIPTION	LOC	QTY
0130-0508-1859	RES. CF 0.5ohm 18/W J 1206	R39, R40, R85, R86	4
0130-4708-1859	RES. CF 4.7ohm 1/8W J 1206	L30, L31, R66	3
0171-2242-0150	PCB MAIN BD 204*121*1.6t FR4 4M	PCB01	1
0174-1740-0130	PCB DISPLAY BD K1 147.5*19.5*1.6t	PCB02	1
0211-0150-1255	LCD MODULE 15.0" TFT AA150XA03	FP02	1
0301-8000-0801	CONN. B TO B FX8C 80P F.M. (FX8C-80S-SV)	W07	1
0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L13	1
0370-0000-3133	CHIP BEAD CORE 80ohm (FCM1608K-800)	L23	1
0400-0511-2000	ZENER 5C3 5.1-5.3V 1/2W	ZD04	1
0400-1451-2000	ZENER 15-2 14.5-15.1V 1/2W	ZD02, ZD03	2
0410-5000-1610	TRANSISTOR 2N3904 SMD	Q2, Q13, Q14, Q19, Q20	5
0420-1001-3601	POWER MOS IRF7304 SMD 8PIN	IC19, IC21	2
0430-1000-1004	IC MM74HC00M SMD 14PIN	IC06	1
0430-1000-5005	IC 74HC86AFN SMD 14PIN	IC17	1
0430-1000-7004	IC 74HC14 SMD 14PIN	IC23	1
0430-1002-6604	IC 74VHC245 SMD 20PIN (TSSOP)	IC10	1
0430-1003-0004	IC DM74LS14MX SMD14PIN	IC15	1
0430-4005-6028	IC ICS1523 SMD 24PIN	IC09	1
0430-4005-7839	IC AM30 SMD 100PIN (MQFP)	IC08	1
0430-6000-4307	IC TL431CZ TO-92 T	IC11, IC33	2
0430-7000-6015	IC TLC2933PWLE SMD 14PIN	IC23	1
0460-2900-0100	WH FPCB 80-8bit 134*119.35mm 1/1Z	FP05	1
0500-0101-0120	INVERTER DC-AC (TAD275-7)		1

COMPLETE PARTS LIST

MODULE NO. 2502-1300-0016 LCD MONITOR 15.0" (VG150)					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
1	M	3150-0132-0331	LCD 15.0" PANEL ASS'Y (VG150)	ASMO01	1
2	M	3150-0022-0334	LCD BASE ASS'Y (VG150/AX150D)	ASMO03	1
3	M	3150-0132-0312	LCD PACKING ASS'Y (VG150)	ASMO07	1

MODULE NO. 3150-0012-0156 LCD DISPLAY BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
1	M	1701-1500-0020	LED HOLDER (LEK4-4.5TB)	LED01N	1
2	M	0440-5000-0020	LED L-59GYW 5□	LEDD01	1
3	M	0174-1740-0130	PCB DISPLAY BD K1 147.75*19.5*1.6t	PCB02	1
4	M	0220-7020-0381	SW TACTILE 6.2*7mm 4P 90' (TSVC-1)	SWD01	1
5	M	0220-7020-0381	SW TACTILE 6.2*7mm 4P 90' (TSVC-1)	SWD02	1
6	M	0220-7020-0381	SW TACTILE 6.2*7mm 4P 90' (TSVC-1)	SWD03	1
7	M	0220-7020-0381	SW TACTILE 6.2*7mm 4P 90' (TSVC-1)	SWD04	1
8	M	0220-7020-0381	SW TACTILE 6.2*7mm 4P 90' (TSVC-1)	SWD05	1
9	M	0451-2000-0964	WAFER 2.00mm 9P 90' Kink	WD01	1

MODULE NO. 3150-0022-0334 LCD BASE ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
10	M	1701-0502-1000	BOTTOM BASE CAB. (VG150)	BS01	1
11	M	1712-0100-0540	BASE BRACKET (VG150)	BS02	1
12	M	1701-1000-0010	BASE FOOT (□18.0*1.5t)	BS02M	4
13	M	1721-0003-1020	TAP. SCREW-TB #3.0*10.0L,Ni	BS02N	1
14	M	1720-3004-1020	MAC. SCREW-MF M4.0*10.0L,Ni	BS02O	2
15	M	1701-0502-0000	FRONT BASE CAB. (VG150)	BS03	1
16	M	1701-0502-2000	REAR BASE CAB. (VG150)	BS04	1
17	M	1712-0100-0531	SUPPORT BRACKET FOR BASE (VG150)	BS05	1
18	M	1721-0003-1020	TAP. SCREW-TB #3.0*10.0L,Ni	BS05M	2

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
19	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C03	1
20	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C04	1
21	M	0101-1331-1211	E/C GEN. 330uF 16V 105' F	C05	1
22	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C09	1
23	M	0101-1109-1504	E/C GEN. 1.0uF 50V RV2 SMD	C10	1
24	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C101	1
25	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C102	1
26	M	0111-3101-5105	C/M Multi 100PF 50V NPO 0805	C103	1
27	M	0101-1220-1204	E/C GEN. 22uF 16V RV2 SMD	C104	1
28	M	0111-3820-5105	C/M Multi 82PF 50V NPO 0805	C105	1
29	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C107	1
30	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C108	1
31	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C109	1
32	M	0111-3101-5105	C/M Multi 100PF 50V NPO 0805	C11	1
33	M	0101-1331-1211	E/C GEN. 330uF 16V 105' F	C110	1
34	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C111	1
35	M	0101-1220-1204	E/C GEN. 22uF 16V RV2 SMD	C112	1
36	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C113	1
37	M	0101-1100-1204	E/C GEN. 10uF 16V RV2 SMD	C114	1
38	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C115	1
39	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C117	1
40	M	0101-1331-1211	E/C GEN. 330uF 16V 105' F	C118	1
41	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C119	1
42	M	0101-1471-1302	E/C GEN. 470uF 25V 85' K	C12	1
43	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C124	1
44	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C127	1
45	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C129	1
46	M	0101-1331-1211	E/C GEN. 330uF 16V 105' F	C13	1
47	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C130	1
48	M	0101-1471-1211	E/C GEN. 470uF 16V 105' F	C131	1
49	M	0101-1471-1211	E/C GEN. 470uF 16V 105' F	C132	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
50	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C133	1
51	M	0101-1471-1211	E/C GEN. 470uF 16V 105' F	C134	1
52	M	0101-1471-1211	E/C GEN. 470uF 16V 105' F	C135	1
53	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C136	1
54	M	0101-1100-1204	E/C GEN. 10uF 16V RV2 SMD	C137	1
55	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C138	1
56	M	0101-1100-1204	E/C GEN. 10uF 16V RV2 SMD	C139	1
57	M	0111-3101-5105	C/M Multi 100PF 50V NPO 0805	C14	1
58	M	0111-3470-5105	C/M Multi 47PF 50V NPO 0805	C140	1
59	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C141	1
60	M	0111-3220-5105	C/M Multi 22PF 50V NPO 0805	C142	1
61	M	0111-3220-5105	C/M Multi 22PF 50V NPO 0805	C143	1
62	M	0101-1100-1204	E/C GEN. 10uF 16V RV2 SMD	C144	1
63	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C145	1
64	M	0101-1331-1211	E/C GEN. 330uF 16V 105' F	C15	1
65	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C16	1
66	M	0111-3100-5105	C/M Multi 10PF 50V NPO 0805	C17	1
67	M	0111-3100-5105	C/M Multi 10PF 50V NPO 0805	C18	1
68	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C181	1
69	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C182	1
70	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C183	1
71	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C184	1
72	M	0101-1109-1504	E/C GEN. 1.0uF 50V RV2 SMD	C19	1
73	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C198	1
74	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C199	1
75	M	0111-3681-5105	C/M Multi 680PF 50V NPO 0805	C20	1
76	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C200	1
77	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C201	1
78	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C202	1
79	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C203	1
80	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C204	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
81	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C205	1
82	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C206	1
83	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C207	1
84	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C208	1
85	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C209	1
86	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C21	1
87	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C210	1
88	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C211	1
89	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C212	1
90	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C214	1
91	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C215	1
92	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C216	1
93	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C217	1
94	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C218	1
95	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C219	1
96	M	0101-1220-1204	E/C GEN. 22uF 16V RV2 SMD	C22	1
97	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C220	1
98	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C221	1
99	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C23	1
100	M	0101-1471-1211	E/C GEN. 470uF 16V 105° F	C24	1
101	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C25	1
102	M	0111-3100-5105	C/M Multi 10PF 50V NPO 0805	C26	1
103	M	0111-3100-5105	C/M Multi 10PF 50V NPO 0805	C28	1
104	M	0111-3100-5105	C/M Multi 10PF 50V NPO 0805	C29	1
105	M	0111-3221-5105	C/M Multi 220PF 50V NPO 0805	C30	1
106	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C31	1
107	M	0101-1331-1211	E/C GEN. 330uF 16V 105° F	C32	1
108	M	0111-3101-5105	C/M Multi 100PF 50V NPO 0805	C33	1
109	M	0111-3470-5105	C/M Multi 47PF 50V NPO 0805	C34	1
110	M	0101-1331-1211	E/C GEN. 330uF 16V 105° F	C35	1
111	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C36	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
112	M	0101-1470-1204	E/C GEN. 47uF 16V RV2 SMD	C37	1
113	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C38	1
114	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C39	1
115	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C41	1
116	M	0101-1470-1204	E/C GEN. 47uF 16V RV2 SMD	C43	1
117	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C44	1
118	M	0101-1220-1204	E/C GEN. 22uF 16V RV2 SMD	C46	1
119	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C47	1
120	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C48	1
121	M	0111-3100-5105	C/M Multi 10PF 50V NPO 0805	C50	1
122	M	0111-3220-5105	C/M Multi 22PF 50V NPO 0805	C51	1
123	M	0111-3101-5105	C/M Multi 100PF 50V NPO 0805	C52	1
124	M	0111-3101-5105	C/M Multi 100PF 50V NPO 0805	C54	1
125	M	0101-1220-1204	E/C GEN. 22uF 16V RV2 SMD	C55	1
126	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C56	1
127	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C57	1
128	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C58	1
129	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	C59	1
130	M	0101-1471-1211	E/C GEN. 470uF 16V 105' F	C60	1
131	M	0101-1470-1204	E/C GEN. 47uF 16V RV2 SMD	C61	1
132	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C64	1
133	M	0101-1109-1504	E/C GEN. 1.0uF 50V RV2 SMD	C65	1
134	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C66	1
135	M	0101-1109-1504	E/C GEN. 1.0uF 50V RV2 SMD	C67	1
136	M	0111-3103-5125	C/M Multi 0.01uF 50V Z5U 0805	C68	1
137	M	0101-1109-1504	E/C GEN. 1.0uF 50V RV2 SMD	C69	1
138	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C81	1
139	M	0130-1003-1859	RES. CF 100Kohm 1/8W J 1206	C82	1
140	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C83	1
141	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C85	1
142	M	0101-1331-1211	E/C GEN. 330uF 16V 105' F	C86	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
143	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C87	1
144	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C88	1
145	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C89	1
146	M	0101-1331-1211	E/C GEN. 330uF 16V 105' F	C90	1
147	M	0101-1220-1204	E/C GEN. 22uF 16V RV2 SMD	C91	1
148	M	0101-2100-1501	E/C B-P 10uF 50V 85'F	C92	1
149	M	0111-3104-5135	C/M Multi 0.1uF 50V Y5V 0805	C95	1
150	M	0111-3101-5105	C/M Multi 100PF 50V NPO 0805	C96	1
151	M	0111-3470-5105	C/M Multi 47PF 50V NPO 0805	C97	1
152	M	0111-3220-5105	C/M Multi 22PF 50V NPO 0805	C98	1
153	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D01	1
154	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D02	1
155	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D03	1
156	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D04	1
157	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D05	1
158	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D06	1
159	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D07	1
160	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D08	1
161	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D09	1
162	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D10	1
163	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D15	1
164	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D17	1
165	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D18	1
166	M	0390-3000-2012	FAST DIODE 15DF4 T	D19	1
167	M	0390-3000-2012	FAST DIODE 15DF4 T	D20	1
168	M	0390-5000-1053	GEN. DIODE 1N4148 SMD	D24	1
169	M	0430-7002-8939	IC AM100 SMD 160PIN (PQFP)	IC02	1
170	M	0430-7000-6015	IC TLC2933PWLE SMD 14Pin	IC03	1
171	M	0430-7001-9040	IC MTV118P-011 SMD 16PIN	IC04	1
172	M	0430-1002-5604	IC 74VHC574MTCX SMD 20PIN (TSSOP)	IC05	1
173	M	0430-1000-1004	IC MM74HC00M SMD-14	IC06	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
174	M	0430-3000-4143	IC HT24C08 DIP 8PIN	IC07	1
175	M	0201-2540-8000	IC SOCKET 2.54mm 8PIN	IC07S	1
176	M	0430-4005-7839	IC AM30 SMD 100PIN (MQFP)	IC08	1
177	M	0430-4005-6028	IC ICS1523M SMD 24PIN	IC09	1
178	M	0430-1002-6604	IC 74VHC245 SMD 20PIN (TSSOP)	IC10	1
179	M	0430-6000-4307	IC TL431CZ TO-92 T	IC11	1
180	M	0430-0000-6004	IC CD4049UBM SMD 16PIN	IC12	1
181	M	0430-3000-2017	IC 24LC21 SMD-8	IC14	1
182	M	0430-1003-0004	IC DM74LS14MX SMD 14PIN	IC15	1
183	M	0430-0000-8004	IC MM74HC4053WMX SMD 16PIN	IC16	1
184	M	0430-1000-5005	IC 74HC86AFN SMD-14 T	IC17	1
185	M	0420-1001-3601	POWER MOS IRF7304 SMD 8PIN	IC18	1
186	M	0420-1001-3601	POWER MOS IRF7304 SMD 8PIN	IC19	1
187	M	0430-4000-2004	IC LM339M SMD-14 T	IC20	1
188	M	0420-1001-3601	POWER MOS IRF7304 SMD 8PIN	IC21	1
189	M	0420-1001-3601	POWER MOS IRF7304 SMD 8PIN	IC22	1
190	M	0430-1000-7004	IC 74HC14 SMD-14	IC23	1
191	M	0430-3000-4143	IC HT24C08 DIP 8PIN	IC24	1
192	M	0201-2540-8000	IC SOCKET 2.54mm 8PIN	IC24S	1
193	M	0430-5003-2140	IC MTV112AN-013 DIP 40 PIN	IC25	1
194	M	0201-2544-0000	IC SOCKET 2.54mm 40PIN	IC25S	1
195	M	0430-0000-2010	IC MC14013B SMD-14	IC30	1
196	M	0430-4004-9402	IC M52743BSP SDIP 36PIN	IC31	1
197	M	0430-6000-4307	IC TL431CZ TO-92 T	IC33	1
198	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L01	1
199	M	0370-0000-1010	FERRITE CORE RH 3.5x6x1.0(W)x2	L02	1
200	M	0370-0000-1110	FERRITE CORE W8 R6H 6x10 2 1/2 T	L07	1
201	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L08	1
202	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L09	1
203	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L11	1
204	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L13	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
205	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L15	1
206	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L16	1
207	M	0130-4708-1859	RES. CF 4.7ohm 1/8W J 1206	L20	1
208	M	0130-4708-1859	RES. CF 4.7ohm 1/8W J 1206	L21	1
209	M	0130-4708-1859	RES. CF 4.7ohm 1/8W J 1206	L22	1
210	M	0370-0000-3133	CHIP BEAD CORE 80ohm (FCM1608K-800)	L23	1
211	M	0130-4708-1859	RES. CF 4.7ohm 1/8W J 1206	L30	1
212	M	0130-4708-1859	RES. CF 4.7ohm 1/8W J 1206	L31	1
213	M	0370-0000-1110	FERRITE CORE W8 R6H 6x10 2 1/2 T	L32	1
214	M	0361-1000-0060	CHOKE COIL L:160uH 1A	L33	1
215	M	0361-1000-0060	CHOKE COIL L:160uH 1A	L34	1
216	M	0344-6880-0603	PEAKING COIL 0.68uH 1/4W K 2012	L35	1
217	M	0171-2242-0151	PCB MAIN BD 204*121*1.6t FR4 4M	PCB01	1
218	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR01	1
219	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR02	1
220	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR03	1
221	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR04	1
222	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR05	1
223	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR06	1
224	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR07	1
225	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR08	1
226	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR09	1
227	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR10	1
228	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR11	1
229	M	0141-3309-3851	ARRAY RES. A(X) 33ohm 4R J 8P	PR12	1
230	M	0141-1002-3851	ARRAY RES. A(X) 10Kohm 4R J 8P	PR13	1
231	M	0141-4700-3851	ARRAY RES. A(X) 470ohm 4R J 8P	PR14	1
232	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR15	1
233	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR16	1
234	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR17	1
235	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR18	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
236	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR19	1
237	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR20	1
238	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR21	1
239	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR22	1
240	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR23	1
241	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR24	1
242	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR25	1
243	M	0141-2200-3851	ARRAY RES. A(X) 220ohm 4R J 8P	PR26	1
244	M	0141-1002-3851	ARRAY RES. A(X) 10Kohm 4R J 8P	PR27	1
245	M	0141-1002-3851	ARRAY RES. A(X) 10Kohm 4R J 8P	PR28	1
246	M	0141-4709-3851	ARRAY RES. A(X) 47ohm 4R J 8P	PR30	1
247	M	0141-1002-3851	ARRAY RES. A(X) 10Kohm 4R J 8P	PR31	1
248	M	0410-5000-2610	TRANSISTOR MMBT3906LT1 SMD	Q01	1
249	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q02	1
250	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q03	1
251	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	Q05	1
252	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	Q06	1
253	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	Q07	1
254	M	0410-5000-2610	TRANSISTOR MMBT3906LT1 SMD	Q09	1
255	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q10	1
256	M	0410-5000-2610	TRANSISTOR MMBT3906LT1 SMD	Q11	1
257	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q12	1
258	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q13	1
259	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q14	1
260	M	0410-5000-2610	TRANSISTOR MMBT3906LT1 SMD	Q15	1
261	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q19	1
262	M	0410-5000-1610	TRANSISTOR MMBT3904LT1 SMD T	Q20	1
263	M	0130-4709-1858	RES. CF 47ohm 1/8W J 0805	R01	1
264	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R02	1
265	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R04	1
266	M	0130-7500-1858	RES. CF 750ohm 1/8W J 0805	R05	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
267	M	0130-2700-1858	RES. CF 270ohm 1/8W J 0805	R06	1
268	M	0130-3301-1858	RES. CF 3.3Kohm 1/8W J 0805	R07	1
269	M	0130-1009-1858	RES. CF 10ohm 1/8W J 0805	R08	1
270	M	0130-4701-1858	RES. CF 4.7Kohm 1/8W J 0805	R09	1
271	M	0130-7500-1858	RES. CF 750ohm 1/8W J 0805	R10	1
272	M	0130-4701-1858	RES. CF 4.7Kohm 1/8W J 0805	R100	1
273	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	R102	1
274	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R103	1
275	M	0130-4302-1858	RES. CF 43Kohm 1/8W J 0805	R104	1
276	M	0130-4701-1858	RES. CF 4.7Kohm 1/8W J 0805	R105	1
277	M	0130-2202-1858	RES. CF 22Kohm 1/8W J 0805	R106	1
278	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R107	1
279	M	0130-4309-1859	RES. CF 43ohm 1/8W J 1206	R108	1
280	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R110	1
281	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R111	1
282	M	0130-4302-1858	RES. CF 43Kohm 1/8W J 0805	R112	1
283	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	R113	1
284	M	0130-3301-1858	RES. CF 3.3Kohm 1/8W J 0805	R114	1
285	M	0130-3301-1858	RES. CF 3.3Kohm 1/8W J 0805	R115	1
286	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R116	1
287	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R117	1
288	M	0130-4701-1858	RES. CF 4.7Kohm 1/8W J 0805	R118	1
289	M	0130-2201-1858	RES. CF 2.2Kohm 1/8W J 0805	R119	1
290	M	0130-3901-1858	RES. CF 3.9Kohm 1/8W J 0805	R12	1
291	M	0130-2700-1858	RES. CF 270ohm 1/8W J 0805	R121	1
292	M	0130-2700-1858	RES. CF 270ohm 1/8W J 0805	R122	1
293	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R123	1
294	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R124	1
295	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R125	1
296	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R126	1
297	M	0130-0000-1859	RES. CF 0.0ohm 1/8W J 1206	R130	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
298	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R132	1
299	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R133	1
300	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	R135	1
301	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R136	1
302	M	0130-2201-1858	RES. CF 2.2Kohm 1/8W J 0805	R137	1
303	M	0130-2202-1858	RES. CF 22Kohm 1/8W J 0805	R138	1
304	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R140	1
305	M	0130-1000-1858	RES. CF 100ohm 1/8W J 0805	R142	1
306	M	0130-1000-1859	RES. CF 100ohm 1/8W J 1206	R146	1
307	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R168	1
308	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R169	1
309	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R170	1
310	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R171	1
311	M	0130-2202-1858	RES. CF 22Kohm 1/8W J 0805	R18	1
312	M	0130-1000-1858	RES. CF 100ohm 1/8W J 0805	R19	1
313	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R197	1
314	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R198	1
315	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R20	1
316	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R204	1
317	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R205	1
318	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R21	1
319	M	0130-4709-1858	RES. CF 47ohm 1/8W J 0805	R215	1
320	M	0130-1001-1858	RES. CF 1.0Kohm 1/8W J 0805	R216	1
321	M	0130-2201-1858	RES. CF 2.2Kohm 1/8W J 0805	R217	1
322	M	0130-1001-1858	RES. CF 1.0Kohm 1/8W J 0805	R26	1
323	M	0130-3001-1858	RES. CF 3.0Kohm 1/8W J 0805	R27	1
324	M	0130-1001-1858	RES. CF 1.0Kohm 1/8W J 0805	R28	1
325	M	0130-2700-1858	RES. CF 270ohm 1/8W J 0805	R31	1
326	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R32	1
327	M	0130-2200-1858	RES. CF 220ohm 1/8W J 0805	R34	1
328	M	0130-2200-1858	RES. CF 220ohm 1/8W J 0805	R35	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
329	M	0130-2201-1858	RES. CF 2.2Kohm 1/8W J 0805	R36	1
330	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R37	1
331	M	0130-1000-1858	RES. CF 100ohm 1/8W J 0805	R38	1
332	M	0130-0508-1859	RES. CF 0.5ohm 1/8W J 1206	R39	1
333	M	0130-0508-1859	RES. CF 0.5ohm 1/8W J 1206	R40	1
334	M	0130-7509-1859	RES. CF 75ohm 1/8W J 1206	R41	1
335	M	0130-7509-1859	RES. CF 75ohm 1/8W J 1206	R42	1
336	M	0130-7509-1859	RES. CF 75ohm 1/8W J 1206	R43	1
337	M	0130-1509-1859	RES. CF 15ohm 1/8W J 1206	R44	1
338	M	0130-2201-1858	RES. CF 2.2Kohm 1/8W J 0805	R45	1
339	M	0130-1000-1858	RES. CF 100ohm 1/8W J 0805	R46	1
340	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R47	1
341	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R48	1
342	M	0130-4701-1858	RES. CF 4.7Kohm 1/8W J 0805	R49	1
343	M	0130-0000-1858	RES. CF 0.0ohm 1/8W J 0805	R50	1
344	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R51	1
345	M	0130-3301-1858	RES. CF 3.3Kohm 1/8W J 0805	R52	1
346	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R53	1
347	M	0130-2201-1858	RES. CF 2.2Kohm 1/8W J 0805	R54	1
348	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R55	1
349	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R56	1
350	M	0130-1009-1858	RES. CF 10ohm 1/8W J 0805	R57	1
351	M	0130-1009-1858	RES. CF 10ohm 1/8W J 0805	R59	1
352	M	0130-1009-1858	RES. CF 10ohm 1/8W J 0805	R61	1
353	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R65	1
354	M	0130-4708-1859	RES. CF 4.7ohm 1/8W J 1206	R66	1
355	M	0130-2200-1859	RES. CF 220ohm 1/8W J 1206	R67	1
356	M	0130-2200-1858	RES. CF 220ohm 1/8W J 0805	R68	1
357	M	0130-4709-1858	RES. CF 47ohm 1/8W J 0805	R69	1
358	M	0130-4709-1858	RES. CF 47ohm 1/8W J 0805	R70	1
359	M	0130-4701-1858	RES. CF 4.7Kohm 1/8W J 0805	R71	1

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
360	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R72	1
361	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R73	1
362	M	0130-2200-1858	RES. CF 220ohm 1/8W J 0805	R74	1
363	M	0130-2200-1858	RES. CF 220ohm 1/8W J 0805	R75	1
364	M	0130-7500-1858	RES. CF 750ohm 1/8W J 0805	R76	1
365	M	0130-7500-1858	RES. CF 750ohm 1/8W J 0805	R77	1
366	M	0130-1001-1859	RES. CF 1.0Kohm 1/8W J 1206	R78	1
367	M	0130-1001-1858	RES. CF 1.0Kohm 1/8W J 0805	R80	1
368	M	0130-7500-1858	RES. CF 750ohm 1/8W J 0805	R81	1
369	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R82	1
370	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R84	1
371	M	0130-0508-1859	RES. CF 0.5ohm 1/8W J 1206	R85	1
372	M	0130-0508-1859	RES. CF 0.5ohm 1/8W J 1206	R86	1
373	M	0130-2209-1858	RES. CF 22ohm 1/8W J 0805	R87	1
374	M	0130-1001-1858	RES. CF 1.0Kohm 1/8W J 0805	R89	1
375	M	0130-2200-1859	RES. CF 220ohm 1/8W J 1206	R90	1
376	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R91	1
377	M	0130-4702-1858	RES. CF 47Kohm 1/8W J 0805	R92	1
378	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R93	1
379	M	0130-8202-1858	RES. CF 82Kohm 1/8W J 0805	R94	1
380	M	0130-4701-1858	RES. CF 4.7Kohm 1/8W J 0805	R95	1
381	M	0130-2202-1858	RES. CF 22Kohm 1/8W J 0805	R96	1
382	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R97	1
383	M	0130-2202-1858	RES. CF 22Kohm 1/8W J 0805	R98	1
384	M	0130-1002-1858	RES. CF 10Kohm 1/8W J 0805	R99	1
385	M	0300-1200-3150	D-SUB Female 90' 15P 3ROW	W01	1
386	M	0451-2000-0464	WAFER 2.00mm 4P 90' Kink	W02	
387	M	0451-2000-0264	WAFER 2.00mm 2P 90' Kink	W03	
388	M	0451-2000-0964	WAFER 2.00mm 9P 90' Kink	W04	
389	M	0451-2000-0564	WAFER 2.00mm 5P 90' Kink	W05	

COMPLETE PARTS LIST

MODULE NO. 315-0092-0150 LCD MAIN BD ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
390	M	0301-8000-0801	CONN. B TO B FX8C 80P F.M.(FX8C-80S-SV)	W07	1
391	M	0302-1360-0011	DC POWER JACK (DJ-034)	W09	1
392	M	0280-1100-0013	X'TAL 11.0592MHz	XR02	1
393	M	0400-1451-2000	ZENER 15-2 14.5-15.1V 1/2W	ZD02	1
394	M	0400-1451-2000	ZENER 15-2 14.5-15.1V 1/2W	ZD03	1
395	M	0400-0511-2000	ZENER 5C3 5.1-5.3V 1/2W	ZD04	1

MODULE NO. 3150-0132-0312 LCD PACKING ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
396	M	1925-1000-0180	EPS FOAM-B (VG150/VG150)	1P11	1
397	M	1925-1000-0170	EPS FOAM-A (VG150/VG150)	1P12	1
398	M	1925-1200-0680	CARTON VG150	1P13	1
399	M	1925-1100-0500	PE BAG (700.0*390.0*0.04)	1P14	1
400	M	1925-1300-0560	MANUAL VG150	1P15	1
401	M	1936-1100-0790	B/C LBL VG150	1P16	1
402	M	1925-1100-0402	PE BAG 360Lx200Wx0.04t/EUROPE	1P19	1
403	M	0300-7002-2050	AC TO DC ADAPTOR (API-208-98010-41) 3PIN	AD01	1
404	M	0320-4000-0010	POWER CORD 6ft 110V UL/CSA AL	PC01	1
405	M	0321-0400-0030	S.CABLE 1500mm 15(3R-3R) 3+6C	SG01	1

MODULE NO. 3150-0132-0331 LCD PANEL ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
406	M	1712-0100-0321	CHASSIS BRACKET (VG150)	FP01	1
407	M	1701-1500-0030	WIRE SADDLE (CH-01C)	FP01M	3
408	M	1701-1500-0040	WIRE SADDLE (CH-20)	FP01N	1
409	M	0211-0150-1255	LCD MODULE 15.0" TFT AA150XA03 (ADI)	FP02	1
410	M	1720-0503-1000	MAC. SCREW-MBSFW M3.0*10.0L,Zn	FP02M	4

COMPLETE PARTS LIST

MODULE NO. 3150-0132-0331 LCD PANEL ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
411	M	1947-1700-1100	GASKET BLOCK (20.0*13.0*10.0)	FP02N	4
412	M	1701-0103-1010	LCD PANEL CAB. VG150(GENERIC)	FP03	1
413	M	1701-0402-5000	BUTTON (VG150)	FP03M	1
414	M	1701-0700-0020	LENS FOR LCD	FP03N	1
415	M	1721-0003-1020	TAP. SCREW-TB #3.0*10.0L,Ni	FP03O	5
416	M	3150-0012-0156	LCD DISPLAY BD ASS'Y (VG150)	FP03P	1
417	M	0460-1009-0021	WH PH9P-PH9P 1061#26 175mm Core*1	FP03Q	1
418	M	3150-0092-0150	LCD MAIN BD ASS'Y (VG150-AM30)	FP04	1
419	M	1712-0100-0380	SUPPORT BKT. FOR M/B (VG150)	FP04M	1
420	M	1720-0003-0410	MAC. SCREW-MB M3.0*4.0L,Zn-Cc	FP04N	6
421	M	1712-0500-0210	SHIELD FOR M/B (VG150)	FP04O	1
422	M	1720-0003-0410	MAC. SCREW-MB M3.0*4.0L,Zn-Cc	FP04P	16
423	M	1701-0900-0060	INSULATOR FOR M/B (VG150)	FP04Q	1
424	M	1947-1700-0020	SHIELDING AL. TAPE (45.0*25.0)	FP04R	2
425	M	0460-2900-0101	WH FPCB 80P-8bit 134*119.35mm 1/1Z	FP05	1
426	M	1947-1700-0120	SHIELDING AL.TAPE (150.0*65.0)	FP05M	1
427	M	0500-0101-0090	INVERTER DC-AC (TAD275-8)	FP06	1
428	M	1720-0003-0410	MAC. SCREW-MB M3.0*4.0L,Zn-Cc	FP06M	2
429	M	0460-1005-0052	WH PH5P-PH5P 1007#24 170mm	FP06N	1
430	M	1712-0500-0221	SHIELD FOR INVERTER (VG150)	FP06O	1
431	M	1720-5003-0420	MAC. SCREW-MI M3.0*4.0L,Ni	FP06P	4
432	M	1712-0900-0020	HINGE ASSY-R (175±15 kgmm)	FP07	1
433	M	1720-1504-1220	MAC. SCREW-MPSWF M4.0*12.0L,Ni	FP07M	3
434	M	1720-1504-1220	MAC. SCREW-MPSWF M4.0*12.0L,Ni	FP07N	2
435	M	1712-0900-0030	HINGE ASSY-L (175±15 kgmm)	FP08	1
436	M	1720-1504-1220	MAC. SCREW-MPSWF M4.0*12.0L,Ni	FP08M	3
437	M	1720-1504-1220	MAC. SCREW-MPSWF M4.0*12.0L,Ni	FP08N	2
438	M	1701-0800-0060	DECORATION PLATE (VG150)	FP09	1
439	M	1721-0003-1020	TAP. SCREW-TB #3.0*10.0L,Ni	FP09M	1
440	M	1701-0201-4000	REAR COVER CAB. (VG150)	FP10	1
441	M	1721-0003-1020	TAP. SCREW-TB #3.0*10.0L,Ni	FP10M	6

COMPLETE PARTS LIST

MODULE NO. 3150-0132-0331 LCD PANEL ASS'Y					
NO	M/S	PART NO	DESCRIPTION	LOC	Q'TY
442	M	1701-1200-1000	REAR DOOR (VG150)	FP11	1

